ENVIRONMENTAL ASSESSMENT

REDUCING LARGE RODENT DAMAGE IN THE COMMONWEALTH OF MASSACHUSETTS

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ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

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LIST OF APPENDICES

ACRONYMS

ADC	Animal Damage Control
AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
atm	Atmosphere (measure of air pressure)
AVMA	American Veterinary Medical Association
AP	Aluminum Phosphide
BO	Biological Opinion
BOH	Board of Health
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CMR	Code of Massachusetts Regulations
CWA	Clean Water Act
CY	Calendar Year
DEA	Drug Enforcement Administration
EA	Environmental Assessment
ECOFRAM	Ecological Committee on FIFRA Risk Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FID	Firearms Identification
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
FY	Fiscal Year
GIS	Geographic Information System
ICWDM	Internet Center for Wildlife Damage Management
IWDM	Integrated Wildlife Damage Management
LD50	Lethal Dose
LTC	License to Carry (Firearms)
LRDM	Large Rodent Damage Management
MDAR	Massachusetts Department of Agricultural Resources
MDEP	Massachusetts Department of Environmental Protection
MDFG	Massachusetts Department of Fish and Game
MDFW	Massachusetts Division of Fisheries and Wildlife
MDPH	Massachusetts Department of Public Health
MESA	Massachusetts Endangered Species Act
MGL	Massachusetts General Law
MOU	Memorandum of Understanding
MSDS	Material Safety Data Sheet
MWPA	Massachusetts Wetlands Protection Act
NAS	National Audubon Society
NASS	National Agricultural Statistics Service
NEFO	New England Field Office
NEPA	National Environmental Policy Act
NHESP	Natural Heritage and Endangered Species Program
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NWCO	Nuisance Wildlife Control Operator
NWRC	National Wildlife Research Center
OC	Order of Conditions
PAC	Problem Animal Control
PEP	Post - Exposure Prophylaxis
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TWS	The Wildlife Society
USACE	U.S. Army Corps of Engineers
USC	United States Code
U.S.	United States
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Services
WDM	Wildlife Damage Management
WS	Wildlife Services
ZP	Zinc Phosphide

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)[1] program in Massachusetts continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with large rodents; hereafter, defined as beaver (*Castor canadensis*), muskrats (*Ondatra zibethicus*), porcupines (*Erethizon dorsatum*), and woodchucks (*Marmota monax*). Normally, individual wildlife damage management actions conducted by the WS program could be categorically excluded from further analysis pursuant to the National Environmental Policy Act (NEPA) and in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c), 60 FR 6000-6003).

The purpose of this Environmental Assessment (EA) is to evaluate cumulatively the individual damage management activities conducted by WS to manage damage and threats to agricultural resources, property, natural resources, and threats to humans caused by large rodents in the Commonwealth of Massachusetts. Individual damage management actions could be conducted by WS when a request for assistance is received and when appropriate licenses or permits are in place or when a depredation permit has been issued by a municipal Board of Health (BOH), the Massachusetts Department of Public Health (MDPH), or the Massachusetts Division of Fisheries and Wildlife (MDFW). This EA will assist in determining if the proposed cumulative management of large rodent damage could have a significant impact on the human environment for both humans and other organisms. The EA will also assist with identifying and addressing issues associated with large rodent damage management and will analyze alternative approaches to address those issues. In addition, this EA will be a planning document to coordinate efforts with other federal, Commonwealth, and local agencies. The public involvement process associated with the development of this EA will inform the public of the proposed activities and will allow for public input into the process. This EA analyzes the potential effects of large rodent damage management when requested, as coordinated between WS, the MDPH, local municipal BOHs, the Massachusetts Department of Agricultural Resources (MDAR), and the Massachusetts Department of Fish and Game (MDFG).

WS is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of program activities, and 5) evaluate and determine if there are any potentially significant or cumulative adverse effects from the proposed program. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (see Appendix A), interagency consultations, and public involvement.

This EA evaluates the need for action to manage damage associated with large rodents in the Commonwealth, the potential issues associated with large rodent damage management, and the environmental consequences of conducting different alternatives to address the need for action and the identified issues. Issues relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic Final Environmental Impact Statement (FEIS)[2] (USDA 1997) and were considered in the preparation of the EA. The issues and alternatives associated with large rodent damage management in Massachusetts were initially developed by WS in consultation with the MDPH, the MDFG, and the MDAR. The MDFW under the MDFG has regulatory authority to manage populations

[1]The WS program is authorized to protect agriculture and other resources from damage caused by wildlife through the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

[2]On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this document and WS' programmatic FEIS.

of large rodents in the Commonwealth. To assist with the identification of additional issues and alternatives to managing damage associated with large rodents in Massachusetts; this EA will be available to the public for review and comment prior to a Decision[3].

1.2 NEED FOR ACTION

Across the United States, human populations have expanded and land has been transformed to meet varying human needs. As the landscape has been altered to meet human needs, wildlife habitat has been substantially changed. Those human needs often compete with wildlife and have inherently increased the potential for negative interactions between wildlife and people. Negative interactions between people and wildlife occur when wildlife cause damage to resources and threaten human safety. Some species of wildlife have adapted to, and thrive in, human altered habitats. Those species, in particular, are often responsible for the majority of the negative interactions between humans and wildlife. When negative interactions occur, people often seek assistance to manage damage to resources and to reduce threats to human safety associated with wildlife. WS' programmatic FEIS summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1997):

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well*."

Both sociological and biological carrying capacities must be applied to resolving wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). Those phenomena are especially important because they define the sensitivity of a community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold is a factor in determining the wildlife acceptance capacity. While the habitat may have a biological carrying capacity to support a higher population of some large rodent species, in many cases, the wildlife acceptance capacity is lower or has been met. Once the wildlife acceptance capacity is met or exceeded, people begin to implement population management or damage reduction methods to alleviate damage or address threats to public safety.

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (Leopold 1933, The Wildlife Society 1990, Berryman 1991). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for wildlife damage management is derived from those specific threats to resources. Those individuals of a wildlife species have no intent to do harm. They utilize habitats (*e.g.*, reproduce, travel, forage) where they can find a

[3]After the development of the EA by WS and after public involvement in identifying new issues and alternatives, WS will issue a Decision. Based on the analyses in the EA after public involvement, a decision will be made to either publish a Notice of Intent to prepare an Environmental Impact Statement or a Finding of No Significant Impact will be noticed to the public in accordance to the NEPA and the Council of Environmental Quality regulations.

niche. If their activities result in actions resulting in lost economic value of resources or threaten human safety, people often characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or poses a threat to human safety, people often seek assistance. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics). Therefore, how damage is defined is often unique to the individual person and damage occurring to one individual may not be considered damage by another individual. However, the use of the term "*damage*" is consistently used to describe situations where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (*i.e.*, has reached an individual threshold). The term "*damage*" is most often defined as economic losses or threats to human safety but could also include a loss in aesthetic value and other situations where the actions of wildlife are no longer tolerable to an individual person.

Wildlife management is often based on balancing wildlife populations and human perceptions, in a struggle to preserve rare species, regulate species' populations, oversee consumptive uses of wildlife, and conserve the environment that provides habitat for wildlife resources. Increasingly, cities, towns, parks, airports, and private properties have become sites of some of the greatest challenges for wildlife management (Adams et al. 2006). When the presence of a prolific, adaptable species is combined with human expansion, land management conflicts often develop. Those large rodent species addressed in this EA are now frequently and abundantly present in cities and towns throughout Massachusetts and across the United States. Wildlife is generally regarded as providing ecological, educational, economic, recreational, and aesthetic benefits (Decker and Goff 1987), and there is enjoyment in knowing wildlife exists and contributes to natural ecosystems (Decker et al. 2001).

Native wildlife adds an aesthetic component to the environment which can provide opportunities for recreational hunting and trapping as well as providing people with valued close contact with nature. Many people, even those persons experiencing damage, consider those species to be a charismatic and valuable component of their environment; however, tolerance differs among individuals.

The need for action to manage damage and threats associated with large rodents in Massachusetts arises from requests for assistance[4] received by WS to reduce and prevent damage from occurring to four major categories: agricultural resources, natural resources, property, and threats to human safety. WS has identified those large rodent species most likely to be responsible for causing damage to those four categories in the Commonwealth based on previous requests for assistance. Table 1.1 lists WS' technical assistance projects involving large rodent damage or threats of large rodent damage to those four major resource types in Massachusetts from the federal fiscal year[5] (FY) 2005 through FY 2011. Technical assistance is provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on large rodent damage management activities that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA.

The technical assistance projects conducted by WS are representative of the damage and threats that are caused by large rodents in Massachusetts. As shown in Table 1.1, WS has conducted 32 technical assistance projects in Massachusetts that addressed damage and threats associated with those large rodent species addressed in this assessment. WS has conducted 16 technical assistance projects involving damage or threats of damage associated with beaver in the Commonwealth. Most requests for assistance were associated with beaver damage to natural resources (*e.g.*, flooding woodland habitat). Over 53% of the requests received by WS for technical assistance involved large rodent damage to natural resources.

[4] WS would only conduct damage management activities after receiving a request for assistance. Before initiating damage management activities, a Memorandum of Understanding, cooperative service agreement, or other comparable document must be signed between WS and the cooperating entity which lists all the methods the property owner or manager would allow to be used on property they own and/or manage.
[5] The federal fiscal year begins on October 1 and ends on September 30 the following year.

Table 1.1 - Technical assistance requests received by WS by species from FY 2005 - FY 2011

Species	Resource				TOTAL
	Agriculture	Property	Natural Resources	Human Safety	
Beaver	1	3	8	4	**16**
Muskrat	0	0	0	1	**1**
Porcupine	0	1	0	0	**1**
Woodchuck	1	2	9	2	**14**
TOTAL	**2**	**6**	**17**	**7**	**32**

WS could also provide direct operational assistance when requested by those persons experiencing damage where WS is directly involved with managing damage by employing methods and techniques to alleviate damage. Direct operational assistance that could be provided by WS will be further discussed in Chapter 3 of this EA. The number of requests for direct operational assistance received by WS is not reflected in the totals shown in Table 1.1.

Although damage and threats can occur throughout the year, damage is highest during those periods when large rodents are feeding heavily or storing food for use during winter months or at times when food sources are limited. As stated previously, the need for action arises from requests received from federal, Commonwealth, municipal, and private entities to provide assistance with resolving damage or threats of damage to four main categories of resources in Massachusetts that include agricultural resources, natural resources, property, and human safety. More specific information regarding large rodent damage to those main categories is discussed in the following subsections of this EA:

Need to Resolve Threats that Large Rodents Pose to Human Safety

A threat to human health is sometimes presented by disease organisms or parasites carried by some mammals, which are transmissible or infectious to humans. Zoonoses (*i.e*., wildlife diseases transmissible to people) are a major concern of cooperators when requesting assistance with managing threats from mammals. Disease transmission not only occurs from direct interactions between humans and mammals but can also occur from interactions with pets and livestock that have direct contact with mammals. Pets and livestock often encounter and interact with mammals which can increase the opportunity of transmission of disease to humans.

In Massachusetts, beaver, muskrat, and woodchucks are common in urban environments and often abundant in suburban and urban environments. Those species have been associated with rabies in Massachusetts and throughout the United States, including states adjacent to Massachusetts. Rabies is an acute, viral disease of mammals most often transmitted through the bite of a rabid animal. The disease can be effectively prevented in humans and many domestic mammal species when treated early, but abundant and widely distributed reservoirs among wild mammals complicate rabies control. The majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons (*Procyon lotor*), skunks (primarily *Mephitis mephitis*), and bats (Order Chiroptera) (USDA 2005). However, between 1999 and 2011 rabies has been reported in 449 woodchucks, three muskrats, and 21 beaver across the United States (see Table 1.2). Table 1.3 provides the number of rabies cases reported in woodchucks, muskrats, and beaver in Massachusetts and the five states that border Massachusetts from 1999 to 2011. There were no reports of rabies in porcupines anywhere in the United States during this period.

Table 1.2 – Woodchucks, muskrat, and beaver reported with rabies in the United States, 1999 – 2010

Species	Year												TOTAL
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Woodchuck	40	48	49	49	31	25	25	43	46	31	32	30	**449**
Muskrat	0	0	0	0	0	1	0	0	0	0	1	1	**3**
Beaver	3	0	3	2	2	1	3	0	4	1	2	0	**21**
TOTAL	**43**	**48**	**52**	**51**	**33**	**27**	**28**	**43**	**50**	**32**	**35**	**31**	**473**

Over the last 100 years, rabies cases in the United States have changed dramatically. About 90% of all animal cases reported annually to CDC now occur in wildlife (Krebs et al. 2000, CDC 2012). Before 1960, the majority of cases were reported in domestic animals. The number of rabies-related human deaths in the United States has declined from more than 100 annually in the early 1900s to an average of one or two people per year in the 1990s. Modern day prophylaxis, which is the series of vaccine injections given to people who have been potentially or actually exposed, has proven almost completely successful in preventing mortality when administered promptly (CDC 2012). In the United States, human fatalities associated with rabies occur in people who fail to seek timely medical assistance, usually because they were unaware of their exposure to rabies. Although human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, exceeding $300 million annually. Those costs include the vaccination of companion animals, maintenance of rabies laboratories; medical costs such as those incurred for exposure case investigations, rabies post-exposure prophylaxis (PEP), and animal control programs (CDC 2012).

Table 1.3 - Woodchucks, muskrat, and beaver reported with rabies in Massachusetts and neighboring States, 1999 - 2010.

State	Species	Year												Total
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
MA	**Woodchuck**	4	4	8	6	2	2	2	0	2	2	5	5	**42**
	Muskrat	0	0	0	0	0	0	0	0	0	0	1	0	**1**
CT	**Woodchuck**	3	4	3	9	0	3	0	8	1	1	3	1	**36**
NH	**Woodchuck**	0	1	2	4	0	0	0	0	2	0	0	1	**10**
NY	**Woodchuck**	10	4	12	8	4	5	3	4	6	4	3	5	**68**
	Beaver	0	0	1	0	0	0	1	0	0	0	0	0	**2**
RI	**Woodchuck**	0	1	1	2	2	0	0	0	1	0	1	0	**8**
VT	**Woodchuck**	0	2	4	0	1	1	0	1	1	1	0	1	**12**

Accurate estimates of the aforementioned expenditures are not available. Although the number of PEPs given in the United States each year is unknown, it is estimated to be about 40,000. When rabies becomes epizootic or enzootic (*i.e.*, present in an area over time but with a low case frequency) in a region, the number of PEPs administered in that area increases. Although the cost varies, a course of rabies immune globulin and five doses of vaccine given over a 4-week period typically exceeds $1,000 (CDC 2012) and has been reported to be as high as $3,000 or more (Meltzer 1996). As epizootics spread in wildlife populations, the risk of "*mass*" human exposures requiring treatment of a large number of people that came into contact with an individual rabid domestic animal infected by wild rabid animals increases. Two cases in Massachusetts, one in 1996 and another in 1998, each involving contact with, or drinking milk from, a single rabid cow required PEPs for 18 and 66 persons, respectively (CDC 1999). From 1990 to 1996, the CDC received reports of 22 incidents of mass human exposures to rabid or presumed-rabid

animals in the United States, resulting in 1,908 persons receiving PEP (median: 33 persons per incident). Between 1991 and 1995, the median cost for PEP in Massachusetts was $2,376 per person, including physician and facility charges meaning these incidents cost approximately $42,768 and $15,681, respectively (CDC 1999). Likely, the most expensive single mass exposure case on record in the United States occurred in 1994, when a kitten from a pet store in Concord, New Hampshire tested positive for rabies after a brief illness. Because of potential exposure to this kitten or to other potentially rabid animals in the store, at least 665 persons received post-exposure rabies vaccinations at a total cost of more than $1.1 million (Noah et al. 1995).

The terrestrial strain of rabies found in Massachusetts and neighboring states is from raccoons. Rabies in raccoons was virtually unknown prior to the 1950s. It was first described in Florida and spread slowly during the next three decades into Georgia, Alabama, and South Carolina. It was unintentionally introduced into the Mid-Atlantic States, probably by translocation of infected animals (Krebs et al. 1998). The first cases appeared in West Virginia and Virginia in 1977 and 1978. Since then, raccoon rabies in the area expanded to form the most intensive rabies outbreak in the United States. The strain is now enzootic in all of the eastern coastal states, as well as Alabama, Pennsylvania, Vermont, West Virginia, and most recently, parts of Ohio (Krebs et al. 2000). Bat strains of rabies are also found in Massachusetts.

Individuals or property owners that request assistance with mammals frequently are concerned about potential disease risks but are unaware of the types of diseases that can be associated with them. In the majority of those types of situations, assistance from WS is requested because of a perceived risk to human health or safety associated with wild animals living in close association with humans, or from animals acting abnormally by roving in human-inhabited areas during daylight, or showing no fear when humans are present.

In the majority of cases in which human health concerns are a major reason for requesting WS' assistance, there may have been no actual cases of transmission of disease to humans by mammals to prompt the request. Thus, it is the risk of disease transmission that is the primary reason for requesting and conducting activities. Situations in Massachusetts where the threat of disease associated with wild mammal populations might occur could be:

- Exposure by residents to the threat of rabies due to populations of large rodents in urban or suburban settings or from companion animals coming in contact with infected woodchucks in any environment. However, beaver and muskrat present a very small rabies threat to humans and companion animals.

- Accumulated droppings from denning or foraging large rodents and subsequent exposure to disease organisms in fecal deposits in an urban or suburban community or at an industrial site where humans must live or work in areas of accumulation. Threats of parasitic infections to humans from *Giardia* spp. resulting from high beaver populations in a park or recreation area where swimming is allowed.

- Threats of *Escherichia coli* (*E. coli*), salmonella, and other disease-causing organisms contaminating drinking water supplies or field crops after flooding of sewer/septic systems due to beaver or muskrat activity.

- Infection of wounds caused by bites or scratches or punctures caused by porcupine quills from intentional or unintentional contact with large rodents, their carcasses, or quills found in domestic animals, particularly dogs.

Burrowing by muskrats and woodchucks may sometimes threaten earthen dams as they form networks of burrows, which can weaken such structures, causing erosion and failure. Such incidents can threaten the safety and lives of people living downstream from the dam. For that reason, managers of such sites are concerned with preventing excessive burrowing by those animals at dam sites. Much of the damage caused by muskrats is primarily through their burrowing activity (Perry 1982, Miller 1994, Linzey 1998) in dikes, dams, ditches, ponds, and shorelines. Muskrats dig burrows into banks, levees, and where higher ground is available, for dens (Perry 1982, Linzey 1998). Muskrats dig burrows with underwater entrances along shorelines and burrowing may not be readily evident until serious damage has occurred. When water levels drop, the muskrat holes are expanded to keep pace with the retreating water level. Additionally, when water levels rise muskrats expand the burrows upward. Those burrows can collapse when walked upon by people or animals and crossed over with heavy equipment (*e.g.*, mowers, tractors).

Beaver activity in certain situations can become a threat to public health and safety (*e.g.*, burrowing into or flooding of roadways and railroad beds can result in serious accidents) (Miller 1983, Woodward 1983). Increased water levels in urban areas resulting from beaver activity can lead to unsanitary conditions and potential health problems by flooding septic systems and sewage treatment facilities (De Almeida 1987, Loeb 1994). Beaver damming activity also creates conditions favorable to mosquitoes and can hinder mosquito control efforts or result in population increases (Wade and Ramsey 1986). While the presence of those insects is largely a nuisance, mosquitoes can transmit diseases, such as encephalitis (Mallis 1982) and West Nile Virus (CDC 2000). In addition, beaver are carriers of the intestinal parasite *Giardia lamblia*, which can contaminate human water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Beach and McCulloch 1985, Wade and Ramsey 1986, Miller and Yarrow 1994). The CDC has recorded at least 41 outbreaks of waterborne Giardiasis, affecting more than 15,000 people. Beaver are also known carriers of tularemia, a bacterial disease that is transmittable to humans through bites by insect vectors or infected animals or by handling animals or carcasses, which are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle-ranching sections of Wyoming, the fecal bacterial count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationists. On rare occasions, beaver may contract the rabies virus and attack humans.

This discussion on disease threats is intended to briefly address the more common known zoonoses found in the United States for those species specifically addressed in this EA but is not intended to be an exhaustive discussion of all potential zoonoses. The transmission of diseases from wildlife to humans is neither well document nor well understood for most infectious zoonoses. Determining a vector for a human infected with a disease known to occur in wildlife populations is often complicated by the presence of the known agent across a broad range of naturally occurring sources. For example, a person with salmonella poisoning may have contracted salmonella bacterium from direct contact with an infected pet but may have also contracted the bacterium from eating undercooked meat or from other sources.

However, wildlife and feral animals are known carries of diseases infectious to people which can increase the risk of transmission directly through contact with infected wildlife and through exposure from contact with livestock and pets that have been exposed to diseased wildlife or feral animals. Disease transmission to humans from wildlife is uncommon with few documented occurrences. However, the infrequency of such transmission does not diminish the concerns of those individuals requesting assistance that are fearful of exposure to a diseased animal since disease transmissions have been documented to occur, especially for rabies. WS actively attempts to educate the public about the risks associated with disease transmission from wildlife to humans through technical assistance and by providing technical leaflets on the risks of exposure.

As stated previously, a common concern among those persons requesting assistance is the threat to human health and safety from disease transmission which has only been heightened from recent, widely publicized zoonoses events like the spread of rabies, West Nile Virus, and Avian Influenza. However, requests are also received for assistance from a perceived threat of physical harm from wildlife especially from predatory wildlife. Human encroachment into wildlife habitat increases the likelihood of human-wildlife interactions. Those species that humans are likely to encounter are those most likely to adapt to and thrive in human altered habitat. Several predatory and omnivorous wildlife species thrive in urban habitat due to the availability of food, water, and shelter. Many people enjoy wildlife to the point of purchasing food specifically for feeding wildlife despite laws prohibiting the act in many areas. The constant presence of human created refuse, readily available water supplies, and lack of predation found in urban areas often increases the survival rates and carrying capacity of wildlife species that are adaptable to those habitats. Often the only limiting factor of wildlife species in and around urban areas is the prevalence of diseases, which can be confounded by the overabundance of wildlife congregated into a small area that can be created by the unlimited amount of food, water, and shelter found within urban habitats.

As people are increasingly living with wildlife, the lack of harassing and threatening behavior by humans toward many species of wildlife combined with anthropogenic food sources, especially around urban areas, has led to a decline in the fear wildlife have toward humans. When wildlife species begin to habituate to the presence of humans and human activity, a loss of apprehension occurs that can lead to threatening behavior toward humans. This threatening behavior continues to increase as human populations expand and the populations of those species that adapt to human activity increase. Threatening behavior can be in the form of aggressive posturing, a general lack of apprehension toward humans, or abnormal behavior.

Although animals attacking humans occurs rarely, there were an average of 177 fatalities annually in the United States from 1991 to 2001, excluding motor vehicle or animal-ridden events and zoonotic infections. Although this is an increase from the 157 average fatalities reported from 1979 to 1990, the United States population has risen and the fatality rate remains essentially the same 6.55 (1979-1990) vs. 6.55 (1991-2001) fatalities per 10 million population (Langley 2005). Often, wildlife exhibiting threatening behavior or a loss of apprehensiveness to the presence of humans is a direct result and indication of an animal inflicted with a disease or regularly uses anthropogenic food sources without harassment or threats from humans. So, requests for assistance are caused by both a desire to reduce the threat of disease transmission and from fear of aggressive behavior either from an animal that is less apprehensive of people or induced as a symptom of disease.

The primary request for assistance to reduce threats to human safety received by WS is to lessen the threat of diseases transmission from exposure to wildlife. Public concerns are due to the high prevalence of rabies in the populations of wildlife.

In addition to disease threats, other physical injuries and threats to human safety can occur from those wildlife species addressed in this assessment. For example, porcupine quills are a natural defense mechanism and very sharp. Quills are also barbed making removal difficult and painful. Human injury may result from direct contact with a porcupine or while attempting to remove quills from a domestic animal such as a dog. Portions of quills may also break off during removal and may result in infection.

Need for Large Rodent Damage Management at Airports

Airports provide ideal conditions for many wildlife species due to the large grassy areas adjacent to brushy, forested habitat used as noise barriers. Access to most airport properties is restricted so wildlife

living within airport boundaries are protected during hunting and trapping seasons and are insulated from many other human disturbances.

The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000, MacKinnon et al. 2001). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995).

According to the Federal Aviation Administration (FAA) Strike Database, between January 1, 1990 and October 31, 2011, aircraft strikes were reported involving two beaver, 19 muskrats, 11 porcupines, and 104 woodchucks across the United States (FAA 2011). Two of those strikes reported damage to the aircraft. The number of large rodent strikes actually occurring is likely to be much greater, since an estimated 80% of civil wildlife strikes go unreported (Cleary et al. 2000).

In addition to damages caused by mammal strikes involving aircraft, those incidents can pose serious threats to human safety. For example, damage to the landing gear during the landing roll or takeoff run can cause a loss of control of the aircraft, causing additional damage to the aircraft and increasing the threat to human safety. Although no large rodent strikes have resulted in more than minor damage, the potential for a serious strike exists. For example, in 2006, a small aircraft in North Carolina struck an Eastern cottontail rabbit (*Sylvilagus floridanus*) and flipped over after the nose gear collapsed. The incident resulted in injury to the pilot and the destruction of the aircraft. The cause of the crash was confirmed by the National Transportation Safety Bureau (FAA 2011).

Need to Resolve Damage and Threats Posed by Large Rodents at Landfills

Large rodents, particularly beaver, woodchucks, and muskrat are often attracted to landfills. Grass planted to stabilize soil used to cover landfills serves as a food source for woodchucks and muskrats and woodchucks burrow in the loose soil on landfill slopes. Drainage ditches, settling and retention ponds, natural and man-made wetlands and other surface water on or adjacent to landfills provide habitat for muskrat and beaver. Woodchuck feeding and burrowing activity can result in erosion of landfill soil exposing buried trash. Woodchuck burrowing and chewing can damage landfill liners designed to contain waste and inhibit water infiltration. Damaged liners may result in leaking of excess nutrients or toxic chemicals into wetlands and groundwater. Muskrat and woodchuck burrowing may damage berms and dams used to create settling or retention ponds used to remove sediments from water or contain contaminated surface water originating from a landfill. Failure of these dams or berms could result in flooding that could threaten human safety, damage property and result in sedimentation of streams or contamination soil and wetlands. Similarly, beaver damming activity can flood settling and retention ponds. Dams may also inhibit access to non-potable water sources used by landfills to control dust.

Need to Resolve Large Rodent Damage to Agricultural Resources

Agriculture continues to be an important sector in the Massachusetts economy with the value of agricultural production totaling nearly $490 million in 2007 (NASS 2010). Agricultural production occurred on nearly 520,000 acres of land in Massachusetts on approximately 7,700 farms (NASS 2010). Besides the production of sod, nursery, and greenhouse plants, the top farm commodities for cash receipts were generated from the production of fruit and vegetables, which together accounted for nearly 33% of the cash receipts in the Commonwealth. Cattle and calves accounted for over $12.4 million in cash receipts in Massachusetts during 2007 with over $50 million in cash receipts from the production of milk (NASS 2010). Swine and equine cash receipts were $2.1 and $5.7 million, respectively. The cattle and

calf inventory on January 1, 2010 was estimated at nearly 43,000 head and the hog inventory was estimated at 10,000 individuals on December 1, 2009 (NASS 2010). Cash receipts from aquaculture totaled over $18.5 million in 2007. The aquaculture industry in Massachusetts raises a variety of freshwater and marine organisms including trout, salmon, oysters, clams, mussels, scallops, and urchins.

Damage to Aquaculture Resources

Aquaculture, the cultivation of finfish and invertebrates in captivity, has grown exponentially in the past several decades (Price and Nickum 1995). Economic loss due to muskrat damage can be very high in some areas, particularly in aquaculture producing areas. In some states damage may be as much as $1 million per year (Miller 1994). Damage to aquaculture resources could occur from the economic losses associated with muskrats killing, consuming, and/or injuring fish and other commercially raised aquatic wildlife. Also of concern to aquaculture facilities is the transmission of diseases by muskrats and beaver from the outside environment to aquaculture facilities, between impoundments, and from facility to facility. Given the confinement of aquatic wildlife inside impoundments at aquaculture facilities and the high densities of those organisms in the impoundments, the introduction of a disease can result in substantial economic losses since the entire impoundment is likely to become infected and result in extensive mortality. Although the actual transmission of diseases through transport by muskrats and beaver is difficult to document, large rodents have the capability of spreading diseases through fecal droppings and possibly through other mechanical means such as on fur and feet.

The principal species propagated in Massachusetts are trout (NASS 2009). In 2007, there were 273 commercial aquaculture facilities in Massachusetts with nearly $18 million in sales (NASS 2009). Aquaculture products account for nearly 4% of all agricultural products sold in Massachusetts (NASS 2010).

Damage and Threats to Livestock Operations

In 2007, cattle, hog, and equine operations in Massachusetts reported cash receipts totaling almost $20.3 million while poultry and egg production totaled over $13.2 million (NASS 2010). Beaver may contaminate farm ponds and wells used as water sources for livestock that could result in illness, either directly with their own droppings or by flooding sewer and septic systems of livestock waste storage ponds. Beaver flooding may result in loss of pasture, hay or corn silage used as livestock feed and felling of trees onto fences may allow access to predators or allow livestock to escape. To a minor extent, muskrat may consume livestock forage in pastures or could damage farm ponds through burrowing. Woodchucks often consume forage in livestock pastures and may carry diseases transmissible to livestock. Livestock, particularly cattle and horses, can be severely injured and require veterinary care or euthanization after stepping into woodchuck burrows and injuring their legs. Livestock inadvertently coming into contact with porcupines could be injured by quills, which without veterinary treatment could result in infection. Such infections could result in failure to gain weight, even weight loss, reduced milk production, miscarriage of young or even death.

Damage to Agricultural Crops

Massachusetts farmers produce a wide variety of cash crops throughout the Commonwealth including corn, hay, potatoes, cranberries, blueberries, vegetables (cucumbers, beans, peas, tomatoes, watermelons, cantaloupes, squash, broccoli, spinach, and other greens), turf nursery crops, and floriculture.

Beaver, muskrat, porcupines and woodchucks may cause damage to a variety of agricultural crops in Massachusetts. Beaver have been observed damaging field and sweet corn by WS personnel in Massachusetts and have been reported feeding on other field crops. They have also been observed by WS

personnel in Massachusetts feeding on commercially grown standing timber and seedling trees. Populations of beaver are abundant in Massachusetts where appropriate habitat occurs. Beaver activities cause flooding of prime bottomland crop fields, causing severe economic losses to agricultural producers. Similar flooding and subsequent killing of trees occurs in some commercial forest tracts, killing harvestable trees or seedlings.

Muskrats eat a variety of natural emergent vegetation (Perry 1982, Linzey 1998) and cultivated crops (Perry 1982). Some of the cultivated crops eaten by muskrats include corn, alfalfa, carrots, and soybeans. However, in Massachusetts, the primary threat caused by muskrats involves damage to dams, berms and levies used to flood cranberry bogs during fall harvest. Failure of dams can cause delay in harvest or loss of the crop while repairs are made. Woodchucks are routinely reported to cause damage to field crops such as row and forage crops, orchards, nursery plants, and commercial gardens.

Porcupines primarily feed on woody vegetation and may cause damage to commercially grown timber, Christmas trees, orchards, and nursery plants.

Need to Resolve Large Rodent Damage Occurring to Property

Large rodents cause damage to a variety of property types in Massachusetts each year. Most damage caused by beaver is a result of dam building, bank burrowing, tree cutting, obstructing culverts, overflow structures and spillways, or flooding. Some cases of beaver damage include roads being flooded, reservoir dams being destroyed by bank den burrows, and train derailments being caused by continued flooding and burrowing (Miller and Yarrow 1994). Housing developments have been threatened by beaver dam flooding. Some small bridges also have been destroyed because of beaver dam-building activity. Miller (1983) estimated that the annual damage by beaver in the United States was $75 to $100 million. The estimated value of beaver damage is perhaps greater than that of any other single wildlife species in the United States, with economic damage estimated to have exceeded $4 billion in the southeastern United States over a 40-year period (Arner and Dubose 1980). In certain southeastern states, losses from beaver damage have been estimated at $3 million to $5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1982). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost to beaver activity (Miller and Yarrow 1994). Surveys in North Carolina and Alabama indicated that the majority of landowners with beaver damage on their property desire damage management via beaver removal (Hill 1976, Lewis 1979, Woodward et al. 1985).

Loker et al. (1999) found that suburban residents also might desire lethal management methods to resolve beaver damage conflicts. Such conflicts, which are viewed as damage, result in adverse impacts that often outweigh benefits (Miller and Yarrow 1994). Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986). Additionally, roads and railroads may be damaged by saturation of the roadbed from beaver flooding or by beaver burrowing into the banks that comprise roadbeds and railroad beds.

Muskrats, porcupines, and woodchucks can cause damage to property through burrowing, feeding, and gnawing. Burrowing activity on earthen dams and dikes can result in failure and flooding of property downstream and equipment working on these structures can be damaged when burrows collapse beneath them. Similarly, motorized farm and yard equipment such as tractors and mowers can be damaged by falling into hidden woodchuck burrows. Woodchuck often feed on backyard vegetable gardens, flower beds and other landscaping plants and even potted plants left on patios and decks. As previously stated, porcupines may chew on any item which has been exposed to salt, particularly items such as hand tools

that have been exposed to human sweat. Porcupine quills may also cause injury to pets, particularly dogs that attempt to bite them. Quills cause significant pain and can even be fatal to dogs and other animals if not properly treated. The WS program in Massachusetts has also documented woodchucks entering parked automobiles from the undercarriage, then gnawing and tearing apart electrical wiring essentially destroying the electrical system.

Need to Resolve Large Rodent Damage Occurring to Natural Resources

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies as representatives of the people. Such resources may be plants or animals, including T&E species, historic properties, or habitats in general. Examples of natural resources in Massachusetts are historic structures and places; parks and recreation areas; natural areas, including unique habitats or topographic features; T&E plants or animals; and any plant or animal populations which have been identified by the public as a natural resource.

Sometimes the activities of beaver, muskrats, porcupines, and woodchucks cause damage to natural resources. This most frequently occurs in relation to plants or other animals, including but not limited to, trees, natural vegetation of other types, other mammals, birds, reptiles, amphibians, and fish. Large rodents causing damage are usually locally overabundant at the damage site, and threaten the welfare of a species population or a site identified as a natural resource. Examples of this might be a woodchuck burrowing under a historic building or beaver feeding on trees in an old growth forest. Some of the species listed as threatened or endangered under the Endangered Species Act (ESA) of 1973 and the Massachusetts Endangered Species Act (MESA) may be preyed upon or otherwise adversely affected by beaver, muskrats, and woodchucks.

Beaver and porcupines can cause extensive damage to timber, seedling trees, and other vegetation in natural areas, park and recreation areas, and wetland mitigation sites in Massachusetts. Beaver activities may also destroy critical habitat types (*e.g*. free-flowing water, riparian areas, and bird roosting and nesting areas) which are important to many wildlife species, including certain species of fish and mussels. Patterson (1951) and Avery (1992) reported the presence of beaver dams could negatively affect fisheries. Beaver dams may adversely affect stream ecosystems by increasing sedimentation in streams, and thereby negatively affecting wildlife that depend on low turbidity. Beaver activity has been suggested to cause serious degradation to riparian habitat, which might otherwise support populations of endangered mussel species in Massachusetts. It should be noted that although beaver may damage or destroy important habitat for some species, beaver wetlands are productive areas that are beneficial to many species and are generally considered beneficial in most natural situations.

Muskrats are largely herbivores; however, they also eat other animals as part of their diet (Perry 1982). Schwartz and Schwartz (1959), Neves and Odom (1989), and Miller (1994) reported muskrats also ate animal matter including mussels, clams, snails, crustaceans (*e.g*., crayfish), and young birds. Fish, frogs and small turtles have also been reported as being consumed by muskrats. Some mussels and small turtles consumed by muskrats may be listed as federal T&E species under the ESA and numerous mussels, snails, crustaceans, fish frogs, turtles and birds consumed by muskrats may be state listed under the MESA. Neves and Odom (1989) reported that muskrats appeared to be inhibiting the recovery of endangered mussels, and are likely placing pigtoe mussels in further jeopardy in the Clinch and Holston Rivers in Virginia. Muskrats can negatively affect native vegetation. When muskrats become over-populated an "*eat-out*" may occur which denudes large areas of aquatic vegetation. Those events may result in the feeding area being unsuitable for other wildlife species for a number of years (O'Neil 1949). The loss of vegetation removes food and cover for muskrats and other wildlife. Marsh damage from muskrats is inevitable when areas heavily populated by muskrats are under-trapped (Lynch et al. 1947).

While overgrazing of vegetation can be beneficial to some bird species, it can also result in stagnant water, which predisposes the same birds to diseases (Lynch et al. 1947).

Woodchucks often cause damage to the grounds of historic sites. They can damage the earthworks of historic battlefields or forts by their burrowing activity. The burrows create large tunnels that accelerate erosion and may lead to the collapse of those features. They allow rainwater to enter which further undermines the structures. The burrows themselves are also a trip hazard to visitors at those sites. Woodchucks may also feed on plant species listed as threatened or endangered under the MESA.

From FY 2008 through FY 2011, the WS' program in Massachusetts was requested to actively protected bog turtle habitat used for hibernation by removing beaver and installing and maintaining a flow control device. In FY 2010, WS was requested to provide assistance with muskrat damage management to protect a reclaimed Superfund Site established by the Environmental Protection Agency (EPA). Muskrat burrowing was threatening earthen berms used to recreate a freshwater wetland adjacent to a saltwater marsh. WS could provide direct operational assistance involving beaver, muskrat, porcupines, and woodchucks that pose a threat to wildlife and plants, including T&E species, and other natural resources to any requester experiencing such damage anywhere in Massachusetts. Projects involving beaver or muskrat may require additional permitting from local boards of health or the MDFW outside the legal trapping seasons.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for large rodent damage management to reduce threats to human safety and to resolve damage to property, agricultural resources, and natural resources on federal, Commonwealth, tribal, municipal, and private land within the Commonwealth of Massachusetts wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting large rodent damage management in the Commonwealth to meet the need for action and evaluates different alternatives to meet that need while addressing those issues. Activities conducted by WS to address threats associated with wildlife, including those large rodents addressed in this assessment, at airports in the Commonwealth would remain as addressed in that EA developed to analyze those activities (USDA 2002). Large rodent damage management activities conducted at airports in the Commonwealth are discussed in this assessment to ensure activities that could occur concurrently are analyzed cumulatively pursuant to the NEPA.

The methods available for use or recommendation under each of the alternatives evaluated are provided in Appendix B. The alternatives and Appendix B also discuss how methods would be employed to manage damage and threats associated with large rodents in the Commonwealth. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives and the employment of those methods by WS to manage or prevent damage and threats associated with large rodents from occurring when requested and when permitted.

Federal, Commonwealth, City, and Private Lands

WS may continue to provide mammal damage management activities on federal, Commonwealth, county, municipal, and private land in the Commonwealth when a request is received for such services by the appropriate property owner or manager. In those cases where a federal agency requests WS' assistance with managing damage caused by large rodents, the requesting agency would be responsible for analyzing those activities in accordance with the NEPA. However, this EA would cover such actions if the requesting federal agency determined the analyses and scope of this EA were appropriate for those

actions and the requesting federal agency adopted this EA through their own Decision based on the analyses in this EA. Therefore, actions taken on federal lands have been analyzed in the scope of this EA.

Hunting, Trapping and Pesticide Licensing and Issuance of Depredation Permits by the Municipal Boards of Health, MDPH and MDFW to Lethally Take Large Rodents in the Commonwealth

The General Laws of Massachusetts (MGL) Chapter 131 Inland Fisheries and Game and other Natural Resources provide for the establishment of the Division of Fisheries and Wildlife within the Department of Fisheries, Wildlife and Environmental Law, now referred to as the Department of Fish and Game as well as the Fisheries and Wildlife Board. The Board appoints the Director of Fisheries and Wildlife who has the authority to take or authorize other persons in writing to take and possess mammals at any time or in any manner for purposes of research, control, or management. The Director also sets open seasons for hunting and trapping and makes rules and regulations relating to the time and length of such open season, bag limits, possession limits, methods of taking, time, and methods of reporting and all other matters pertaining to such open season as they may deem necessary and expedient, and may suspend or modify the open season whenever in their opinion such action becomes necessary.

MGL 131 is implemented under the Code of Massachusetts Regulations (CMR) 321 CMR 2:00 Miscellaneous Regulations Relating to Division of Fisheries and Wildlife. These regulations address permits to take and possess wildlife, establish classes of hunting and trapping licenses, defines legal traps, implements the permitting process for addressing beaver and muskrat threats to human health and safety, issuance of permits for use of registered toxicants to control mammals species, licensing and rules pertaining to Problem Animal Control (PAC) agents also referred to as Nuisance Wildlife Control Operators (NWCOs).

In Massachusetts, beaver, muskrat, porcupines, and woodchucks may be lethally taken in a number of circumstances. Beaver and muskrat are considered furbearers and may be taken by licensed trappers during established trapping seasons using approved live traps. Porcupines and woodchucks are afforded little state protection and may be taken by licensed hunters with no closed season.

All four species may be trapped or hunted by a property owner or tenant experiencing damage to any property or crop other than uncultivated grass. They may also authorize their immediate family member or full time permanent employee to conduct such trapping or hunting. Property owners or their agents may obtain permits from local Boards of Health, or if denied, appeal to the MDPH or MDFW for permits to take beaver or muskrats creating a threat to human health and safety either outside the regulated trapping season or through the use of regulated conibear type traps. Muskrats, porcupines, and woodchucks are considered species addressable by PACs and may be trapped and euthanized by PAC agents.

The MDFW was consulted during the development of is EA to analyze cumulative take of those large rodent species addressed in this EA from the issuance of hunting, trapping, and PAC licenses to entities within the Commonwealth and to ensure compliance with the NEPA. The MDFW has jurisdiction over the management of mammal species in Massachusetts and has specialized expertise in identifying and quantifying potential adverse effects to the human environment from mammal damage management activities.

Native American Lands and Tribes

The WS program in Massachusetts would only conduct damage management activities when requested by a Native American Tribe and only after a Memorandum of Understanding (MOU) or cooperative service agreement has been signed between WS and the Tribe requesting assistance. Therefore, the Tribe would

determine when WS' assistance is required and what activities would be allowed. Because Tribal officials would be responsible for requesting assistance from WS and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would be anticipated. Those methods available to alleviate damage associated with large rodents on federal, State, county, municipal, and private properties under the alternatives analyzed in this EA would also be available for use to alleviate damage on Tribal properties when the use of those methods have been approved for use by the Tribe requesting WS' assistance. Therefore, the activities and methods addressed under the alternatives would include those activities that could be employed on Native American lands, when requested and agreed upon.

Period for which this EA is Valid

If the analyses in this EA indicates an Environmental Impact Statement (EIS) is not warranted, this EA would remain valid until WS, in consultation with the MDFG, determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document would be reviewed and supplemented pursuant to the NEPA. Review of the EA would be conducted to ensure that the EA is sufficient. This process ensures the EA would be complete and still appropriate to the scope of large rodent damage management activities conducted by WS in Massachusetts.

Site Specificity

Actions could be taken to alleviate threats to human health and safety, reduce damage to agricultural resources, alleviate property damage, and protect native wildlife, including T&E species, in the Commonwealth. As mentioned previously, WS would only conduct damage management activities when requested by the appropriate property owner or manager. In addition, WS' activities that could involve the lethal take of those mammal species addressed in this assessment under the alternatives would only occur when permitted by the MDFW and only at levels permitted.

This EA analyzes the potential impacts of large rodent damage management and addresses activities on all private and public lands in Massachusetts under MOU, cooperative service agreement, and in cooperation with the appropriate public land management agencies. It also addresses the potential impacts of large rodent damage management on areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional large rodent damage management efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the program.

Those large rodents addressed in this EA can be found statewide and throughout the year in the Commonwealth; therefore, damage or threats of damage can occur wherever those species occur. Planning for the management of large rodent damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Although some of the sites where large rodent damage could occur can be predicted, all specific locations or times where such damage would occur in any given year cannot be predicted. The threshold triggering an entity to request assistance from WS to manage damage associated with large rodents is often unique to the individual; therefore, predicting where and when such a request for assistance would be received by WS is difficult. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever large rodent damage and resulting management occurs, and are treated as

such.

Chapter 2 of this EA identifies and discusses issues relating to large rodent damage management in Massachusetts. The standard WS Decision Model (Slate et al. 1992, USDA 1997) would be the site-specific procedure for individual actions conducted by WS in the Commonwealth (see Chapter 3 for a description of the Decision Model and its application). Additional information on the Decision Model is available in WS' programmatic FEIS (USDA 1997). Decisions made using the model would be in accordance with WS' directives and standard operating procedures (SOPs) described in this EA as well as relevant laws and regulations.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Massachusetts. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to accomplish its mission.

Summary of Public Involvement

Issues related to large rodent damage management as conducted by WS in Massachusetts were initially developed by WS in consultation with the MDFG. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document would be noticed to the public through legal notices published in local print media, through direct mailings to parties that have requested to be notified or have been identified to have an interest in the reduction of threats and damage associated with large rodents in the Commonwealth, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

WS will provide for a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final Decision or publication of a notice of intent to prepare an EIS.

1.4 RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

***WS' Programmatic Final Environmental Impact Statement*:** WS has developed a programmatic FEIS that addresses the need for wildlife damage management in the United States (USDA 1997). The FEIS contains detailed discussions of potential impacts to the human environment from wildlife damage management methods used by WS. In addition, the FEIS contains risk assessments of those methods available to manage damage caused by large rodents in the Commonwealth (USDA 1997). Pertinent information available in the FEIS has been incorporated by reference into this EA.

***WS' Environmental Assessment - Statewide Wildlife Damage Management at Airports in Massachusetts*:** In 2002, the WS program in the Commonwealth developed an EA to address the need to reduce threats associated with wildlife at airports (USDA 2002). The EA evaluated the issues associated with managing wildlife threats, including threats associated with large rodents, at airports and developed alternatives to address those issues. Based on the analyses in the EA, a Finding of No Significant Impact (FONSI) was issued selecting the proposed action alternative in the EA to address the identified need. The proposed action evaluated an integrated approach using lethal and non-lethal methods to address the need for action. The analyses in the EA would remain appropriate for WS' activities conducted to reduce threats associated with wildlife, including large rodents, at airports in the Commonwealth. The analyses

in that EA will be discussed in this assessment to ensure WS' activities to address large rodent damage are evaluated cumulatively. A cumulative assessment of activities conducted by WS in the Commonwealth would ensure those activities are not sufficient to warrant the preparation of an EIS.

Supplemental Environmental Assessment – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States: WS issued an EA that analyzed the environmental effects of WS' involvement in the funding of and participation in Oral Rabies Vaccination programs to eliminate or stop the spread of raccoon rabies in a number of eastern states (including Massachusetts) and gray fox and coyote rabies in Texas. The EA has been supplemented to analyze changes in the scope and analysis area of the ORV program. The most recent Decision/FONSI was signed on January 6, 2009. WS determined the action would not have any significant impact on the quality of the human environment. Pertinent information from this document has been incorporated by reference into this EA.

1.5 AUTHORITY OF FEDERAL AND COMMONWEALTH AGENCIES

The authorities of WS and other agencies as those authorities relate to conducting wildlife damage management activities are discussed by agency below:

WS' Legislative Authority

The primary statutory authorities for WS' program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with wildlife. WS' directives[6] define program objectives and guide WS' activities in managing wildlife damage.

United States Environmental Protection Agency

The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) which regulates the registration and use of pesticides, including repellents to disperse mammals and burrow fumigants.

United States Fish and Wildlife Service Authority

The United States Fish and Wildlife Service (USFWS) mission is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Responsibilities are shared with other federal, state, tribal, and local entities; however, the USFWS has specific responsibilities for the protection of T&E species under the ESA, migratory birds, inter-jurisdictional fish, and certain marine mammals, as well as for lands and waters that the USFWS administers for the management and protection of those resources. The USFWS also manages lands under the National Wildlife Refuge System.

The USFWS is responsible for managing and regulating those species that are listed as threatened or endangered under the ESA, for protecting migratory bird populations and for managing species and habitats within the refuge system which may be adversely affected by large rodents.

[6]WS' Directives could be found at the following web address http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml during the development of this EA.

Massachusetts Department of Fish and Game

The MDFG was established under Massachusetts General Law (MGL) Part 1, Title XIX, Chapter 131 and is within the Executive Office of Environmental Affairs. Chapter 131 also provides the MDFG authority to manage fish and wildlife in the Commonwealth. This authority is exercised through the MDFW.

Massachusetts Division of Fisheries and Wildlife

Established under MGL Part 1, Title XIX, Chapter 131, Section 1A, the MDFW was created under the MDFG. It is under the supervision of the Fisheries and Wildlife Board which appoints the Director of Fisheries and Wildlife. The Director, subject to the approval of the Fisheries and Wildlife Board, may appoint an assistant director and may employ such experts, clerks and other employees necessary for the Division's operations. The director, under control of the board, directs and supervises all matters relative to the division and its employees, carries out the policies of the board. The director also has the power, notwithstanding any other provisions of Chapter 131, but subject to federal law, rules and regulations, to take or in writing authorize other persons to take and possess mammals at any time or in any manner for purposes of observation, research, control or management. At the director's discretion, fees for permits or licenses may be excused to persons so authorized from any licensing provision of Chapter 131.

The Natural Heritage and Endangered Species Program (NHESP) within the MDFW is responsible for the conservation and protection of the biodiversity in Massachusetts. The NHESP is primarily responsible for the management of the approximately 176 species of vertebrate and invertebrate animals and 259 species of native plants and their habitats that are officially listed as Endangered, Threatened or of Special Concern under the Massachusetts Endangered Species Act.

Massachusetts Department of Agricultural Resources, Division of Regulatory and Consumer Services, Pesticide Bureau

The Pesticide Bureau carries out the day to day responsibilities of regulating pesticides in the Commonwealth of Massachusetts. The Bureau also acts as support staff for the Pesticide Board and subcommittee. The major functions of the Bureau are broken down into specific programs. The Pesticide Bureau is responsible for enforcing all pesticide regulations and laws, both Commonwealth and federal. The Bureau is responsible for carrying out provisions of the Massachusetts Pesticide Control Act. Through cooperative agreements with the EPA, the department also implements provisions of the FIFRA.

1.6 COMPLIANCE WITH LAWS AND STATUTES

Several laws or statutes authorize, regulate, or otherwise affect WS' activities. WS would comply with those laws and statutes and consult with other agencies as appropriate. WS would comply with all applicable federal, Commonwealth, and local laws and regulations in accordance with WS Directive 2.210.

National Environmental Policy Act

All federal actions are subject to the NEPA (Public Law 9-190, 42 U.S.C. 4321 et seq.). WS follows CEQ regulations implementing the NEPA (40 CFR 1500 et seq.), USDA (7 CFR 1b), and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and

minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated in part by CEQ through regulations in 40 CFR, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS guidelines concerning Implementation of NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

Pursuant to the NEPA and CEQ regulations, this EA documents the analyses resulting from federal actions, informs decision-makers, and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of the NEPA are infused into federal agency actions. This EA was prepared by integrating as many of the natural and social sciences as warranted, based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

Endangered Species Act

Under the ESA, all federal agencies will seek to conserve T&E species and will utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "*any action authorized., funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency will use the best scientific and commercial data available*" (Sec.7 (a) (2)).

WS obtained a Biological Opinion (BO) on programmatic activities from the USFWS in 1992 describing potential effects on T&E species, and prescribing reasonable and prudent measures for avoiding jeopardy (see Appendix F in USDA 1997). As part of the development of this EA, WS contacted the USFWS regarding T&E species in Massachusetts and was provided procedures to follow regarding the consultation process for individual activities which are discussed further in Chapter 4.

National Historic Preservation Act (NHPA) of 1966, as amended

The NHPA and its implementing regulations (36 CFR 800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. None of the large rodent damage management methods described in this EA that might be used operationally by WS causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that could be used by WS under the alternatives are not generally the types of methods that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance wildlife have the potential for audible effects on the use and enjoyment of historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage problem, which means such use, would be to the benefit of the historic property. A built-in factor for this issue is that virtually all the methods involved would only have temporary effects on the audible nature of a site and could be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects.

Site-specific consultation as required by the Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice - Executive Order 12898

Executive Order 12898, entitled "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*" promotes the fair treatment of people of all races, income levels, and cultures with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental justice is a priority within APHIS and WS. Executive Order 12898 requires federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minorities and persons or populations of low income. APHIS implements Executive Order 12898 principally through its compliance with the NEPA. All WS' activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS' personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the alternatives would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

Protection of Children - Executive Order 13045

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed large rodent damage management program would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

The Native American Graves and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods integrated into the WS' program in Massachusetts, including the use of or recommendation of repellents are registered with and regulated by the EPA and the MDAR, and used or recommended by WS in compliance with labeling procedures and requirements.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280)

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants

would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity. As appropriate, a consistency determination would be conducted by WS to assure management actions would be consistent with the Commonwealth's Coastal Zone Management Program.

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected*." This standard includes birds that may cause safety and health concerns at workplaces.

Investigational New Animal Drug (INAD)

The United States Food and Drug Administration (FDA) can grant permission to use investigational new animal drugs commonly known as INAD (see 21 CFR 511). WS does not currently use any form of INAD in Massachusetts. However, if any are developed to be used either as a method for resolving large rodent damage and or reduce zoonotic disease threats to humans and other wildlife, they may be utilized. Examples may include tranquilizers used for capture or vaccines or treatments for rabies, Giardia, or tularemia.

Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360)

This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration (FDA).

Controlled Substances Act of 1970 (21 U.S.C. 821 et seq.)

This law requires an individual or agency to have a special registration number from the federal Drug Enforcement Agency (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994

The Animal Medicinal Drug Use Clarification Act and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in damage management programs. Those requirements are: (1) a valid "*veterinarian-client-patient*" relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (*i.e.*, a period of time after a drug is administered that must lapse before an animal may be used for food) for specific drugs.

Inland Fisheries and Game and Other Natural Resources (MGL c.131 and Regulations 310 CMR 10.00 and 321 CMR 2.00 and 3.00)

This law establishes the Massachusetts Department of Fish and Game and under it the Division of Fisheries and Wildlife. It also provides for the Fisheries and Wildlife Board and the Director of the Division of Fisheries and Wildlife and designates their responsibilities and powers. Regulations established pursuant to this statute regulate trapping, hunting, problem animal management, wetlands protection and manipulation or removal of beaver dams.

Powers of Inland Fisheries and Game Director (MGL c.131, s.4 p.2)

MGL c.131, Section 4, paragraph 2 provides the Director of the Inland Fisheries and Game authority to take or authorize other persons in writing to take mammals and other animals at any time or in any manner for purposes of control or management. This paragraph reads as follows:

"*Notwithstanding any other provisions of this chapter, but subject to federal law, rules and regulations, take or in writing authorize other persons to take and possess fish, fish spawn, birds, the nest or eggs thereof, mammals, reptiles or amphibians at any time or in any manner for purposes of observation, research, control or management for which a fee shall be charged, the amount of which shall be determined annually by the commissioner of administration under the provision of section three B of chapter seven, and, in the director's discretion, excuse certain persons so authorized from any licensing provision of this chapter and he may, subject to federal law, rules and regulations, regulate the trapping and taking of raptors for the purpose of falconry in accordance with rules and regulations established under the provisions of section five*."

Leghold Traps and Certain Other Devices Restricted; Punishment/Use of Certain Traps for the Taking of Fur-bearing Mammals (MGL c.131 Section 80A: Regulations 321 CMR 2.08)

This law bans the use, manufacture, or possession any trap for the purpose of capturing furbearing mammals, except for common type mouse and rat traps, nets, and box or cage type traps, as otherwise permitted by law. A box or cage type trap is defined by this law as one that confines the whole animal without grasping any part of the animal. Other than nets and common type mouse or rat traps, traps designed to capture and hold a furbearing mammal by gripping the mammal's body, or body part are prohibited, including steel jaw leghold traps, padded leghold traps, snares and species specific traps such as those used to capture raccoons. Conibear traps are allowed for controlling beaver and muskrat to protect human health and safety. However, the MDFW acknowledges that this restriction does not apply to WS activities on federal lands (see Appendix E; W. MacCallum, MDFW pers. comm. 2010).

WS has experienced a conflict with 321 CMR 2.08 previously. This regulation requires a 10-day emergency permit to control beaver or muskrats causing a threat to human health and safety using restricted conibear traps or to trap outside the legal season be issued by a municipal BOH, the MDPH, or the Federal Department of Public Health defined as the United States Public Health Service. While preparing to conduct beaver damage management on federal property, WS attempted to obtain a 10-day emergency permit from the appropriate municipal BOH. Because the location was federal property, the BOH referred WS to the MDPH. The MDPH made the determination that they did not have jurisdiction to issue a permit for beaver management on federal property and had no contact information for the United States Public Health Service referred to in 321 CMR 2.08. The judgment of the MDPH was that federal sovereignty superseded state law in this matter (M. Celona, MDPH per. comm. 2010). A United States Public Health Service official attached to the United States Department of Defense was contacted and was unable to provide assistance and provided contact information for the United States Public Health Service Headquarters. United States Public Health Service Headquarters was unable to provide

additional guidance (P. Jacobs, USPHS, per. comm. 2010). Because the agency named in 321 CMR 2.08 was unable to provide the necessary assistance, the WS-Operational Support Staff was contacted and after conferring with the Office of General Council, the Office of General Council recommended conducting control operations in compliance with WS Directive 2.210 - Compliance with Federal, State, and Local Laws and Regulations issued on October 27, 2009. This policy states "[a]*ll employees (Federal and non-Federal) are responsible for conducting official duties in compliance with all Federal laws, and also applicable State, and local laws that do not directly and substantively conflict with and frustrate WS' Federal statutory authorities. In a situation requiring a variance from a State or local law or regulation that does not directly and substantively conflict with and frustrate WS' Federal statutory authorities, either the State or local authority agrees to carry out the action in cooperation with WS or a written authorization or concurrence must be obtained from the appropriate State or local authority*." Because there is no individual designated with authority to issue permits for beaver control by the United States Public Health Service as designated by 321 CMR 2.08, this statute substantively conflicts with WS' federal statutory authority because it provides no means of obtaining a permit to control beaver on federal lands in compliance with state laws and regulations.

Problem Animal Control Regulations 321 CMR 2.14

"The purpose of 321 CMR 2.14 is to control problem animals. In accordance with MGL c.131, s.4, problem animal control agents may harass, take, and destroy, or may release or liberate as stipulated in 321 CMR 2.14 (20), such problem animals as are set forth in 321 CMR 2.14 (20). Problem animal control agents may also disturb, remove, or destroy dens, lodges, burrows, or nests of such problem animals on property of such persons as who have engaged the services of the problem animal control agent. Nothing in 321 CMR 2.14 shall allow or be construed to allow the propagation of wildlife contrary to 321 CMR 2.12 or the rehabilitation of wildlife contrary to 321 CMR 2.13.

Problem Animals means non-domesticated reptiles, birds, and mammals the actions of which have or are endangering the life and health of humans or domestic animals; damaging the property of a person except grass or other natural vegetation growing without cultivation and which is not harvested or otherwise put to material use by the owner or tenant thereof; obstructing the reasonable and comfortable use of property by the owner or tenant thereof and which cannot be abated in another fashion; or otherwise producing such material annoyance, inconvenience, and discomfort that can reasonably be presumed to result in damage or hurt to persons or their property.

A problem animal control permit shall authorize the permittee to control problem animals of the following species or groups of species: snapping turtle, starling, pigeon (rock dove), house (English) sparrow, opossum, moles, bats except those species listed in 321 CMR 10.60, cottontail rabbits, European rabbit, chipmunk, gray squirrel, red squirrel, flying squirrels, woodchuck, muskrat, rats, mice, and voles except those species listed in 321 CMR 10.90, porcupine, raccoon, short-tailed weasels, long-tailed weasels, red fox, gray fox, coyote, and striped skunk. The Director may authorize individual permittees to control problem animals of other species or groups of species at such times and in such locations as he shall determine. Other allowable methods include shooting with a firearm when done in accordance with provisions of M.G.L. c. 131, c. 140, and c. 269; hand nets or noose poles; fumigant cartridges for the control of woodchucks; and anticoagulant rodenticides for the control of rats, mice and voles when not in conflict with M.G.L. c. 131, § 43, or c. 270, § 3A. Dogs may be used to track or locate problem animals. The Director may authorize the chemical restraint of certain problem animals by employees of a municipal entity, provided that such persons satisfy the Director as to their training and experience in such chemical restraint and provided that such persons are otherwise authorized in accordance with M.G.L. c. 94C and applicable federal law.

Killing of Game by Owner or Tenant of Land; Reports MGL c.131, s.37

Under MGL c.131, Section 37 *"an owner or tenant of land or, if authorized by such owner or tenant, any member of his immediate family or his employee, as defined pursuant to section one of chapter sixty-two B, may, upon such land:*

(1) Kill or attempt to kill, by means other than poisoning or trapping, any wild bird damaging his property, including domesticated animals, poultry and game on game-rearing farms or preserves, provided that such killing is not contrary to any federal law, rule or regulation.

(2) Hunt or take by other means, except by poison or snare, any mammal which he finds damaging his property except grass growing on uncultivated land.

No such owner or tenant shall authorize any person, other than a member of his immediate family or a person permanently employed by him, to place traps for the protection of said property other than during the open season, unless such owner or tenant has first obtained from the director a permit authorizing him so to do, which permit the director is hereby authorized to issue in his discretion, unless such authorized person holds a trapping license. All deer so killed shall be turned over to any environmental police officer and shall be disposed of by the director of law enforcement.

The following written reports shall be sent to the director by such owner or tenant acting under authority of this section:—(a) upon the taking of pheasant, ruffed grouse, hares or rabbits, or the wounding or killing of a deer, a report stating the time and place, kind and number of birds or mammals so taken, wounded or killed, within twenty-four hours of such taking, wounding or killing; (b) upon the taking of any other birds or mammals, a report on or before January thirty-first of each year, stating the number and kinds of birds or mammals taken under authority of this section during the previous year. This section shall not be construed to limit any other provisions of this chapter."

The Massachusetts Wetlands Protection Act (MWPA) MGL c.131, s.40 and Regulations 310 CMR 10.00

This section of MGL 131 protects rare animal species by prohibiting alterations that would have short or long term adverse effects on the wetland habitats of rare wildlife species. The regulations require that proposed alterations to wetland habitats of rare wildlife be reviewed by the Natural Heritage and Endangered Species Program (NHESP).

To screen for potential impacts to rare wetland wildlife habitat, the NHESP developed town maps of Estimated Habitats of Rare Wildlife. These maps show habitat that is based on documented occurrences of rare wetlands wildlife within the last 25 years. Estimated Habitat maps are available from local Conservation Commissions and are published in the Natural Heritage Atlas, and are available at the Mass GIS website.

MWPA Filing is required if a project is within Estimated Habitat of Rare Wildlife and a Notice of Intent (NOI) is required, a copy of the NOI must be sent to the NHESP, no later than the date of filing of the NOI with the applicable Conservation Commission, for review. Proponents are also required to file under MESA, unless a project qualifies for a MESA exemption. If a project is exempt from MESA review, proponents should be aware that a copy of the NOI must still be provided to the NHESP which may request surveys for rare species following standard protocols be conducted.

As specified in the MWPA Regulations, (310 CMR 10.37, 10.58(4)(b), and 10.59), the NHESP responds within 30 days of receipt of a complete NOI filing. The response letter to the applicable municipal

Conservation Commission provides a determination of whether or not the area to be altered by a proposed project is actual wetland resource area habitat for a state-listed rare wildlife species. The NHESP would also determine whether the proposed project could have an adverse effect on the actual habitat of rare wildlife. The NHESP response letter may contain conditions that must be adhered to in order to avoid an adverse effect to rare species habitat, or recommendations for revising the project prior to resubmission. The conservation commission may not issue an Order of Conditions (OC) for a project in Estimated Habitat until the NHESP has provided a determination letter. According to the regulations, the conservation commission shall presume the opinion of the NHESP to be correct. If the NHESP requires conditions or project modifications in order to prevent an "adverse effect," then these conditions must be included in the Order of Conditions. In such cases, a copy of the OC must be mailed to the NHESP upon issuance.

Massachusetts Wildlife Protection Act of 1996 (Question 1) Leghold traps and certain other devices restricted; punishment (MGL c.131, s.80a)

"Notwithstanding any other provision of this chapter, a person shall not use, set, place, maintain, manufacture or possess any trap for the purpose of capturing furbearing mammals, except for common type mouse and rat traps, nets, and box or cage type traps, as otherwise permitted by law. A box or cage type trap is one that confines the whole animal without grasping any part of the animal, including Hancock or Bailey's type live trap for beavers. Other than nets and common type mouse or rat traps, traps designed to capture and hold a furbearing mammal by gripping the mammal's body, or body part are prohibited, including steel jaw leghold traps, padded leghold traps, and snares.

The above provision shall not apply to the use of prohibited devices by federal and state departments of health or municipal boards of health for the purpose of protection from threats to human health and safety. A threat to human health and safety may include, but shall not be limited to: (a) beaver or muskrat occupancy of a public water supply; (b) beaver or muskrat-caused flooding of drinking water wells, well fields or water pumping stations; (c) beaver or muskrat-caused flooding of sewage beds, septic systems or sewage pumping stations; (d) beaver or muskrat-caused flooding of a public or private way, driveway, railway or airport runway or taxi-way; (e) beaver or muskrat-caused flooding of electrical or gas generation plants or transmission or distribution structures or facilities, telephone or other communications facilities or other public utilities; (f) beaver or muskrat-caused flooding affecting the public use of hospitals, emergency clinics, nursing homes, homes for the elderly or fire stations; (g) beaver or muskrat-caused flooding affecting hazardous waste sites or facilities, incineration or resource recovery plants or other structures or facilities whereby flooding may result in the release or escape of hazardous or noxious materials or substances; (h) the gnawing, chewing, entering, or damage to electrical or gas generation, transmission or distribution equipment, cables, alarm systems or facilities by any beaver or muskrat; (i) beaver or muskrat-caused flooding or structural instability on property owned by the applicant if such animal problem poses an imminent threat of substantial property damage or income loss, which shall be limited to: (1) flooding of residential, commercial, industrial or commercial buildings or facilities; (2) flooding of or access to commercial agricultural lands which prevents normal agricultural practices from being conducted on such lands; (3) reduction in the production of an agricultural crop caused by flooding or compromised structural stability of commercial agricultural lands; (4) flooding of residential lands in which the municipal board of health, its chair or agent or the state or federal department of health has determined a threat to human health and safety exists. The department of environmental protection shall make any determination of a threat to a public water supply.

An applicant or his duly authorized agent may apply to the municipal board of health for an emergency permit to immediately alleviate a threat to human health and safety, as defined in the previous paragraph. If the municipal board of health determines that such a threat exists, it shall immediately issue said

emergency permit to alleviate the existing threat to human health and safety, for a period not exceeding ten days. If denied, the applicant or his duly authorized agent may appeal said emergency permit application to the state department of public health or director. If the state department of public health or director determines that such a threat exists, it shall immediately issue said emergency permit to alleviate the existing threat to human health and safety, for a period not exceeding ten days.

Massachusetts Endangered Species Act (MESA) (MGL c.131A and regulations 321 CMR 10.00)

The Massachusetts Endangered Species Act (M.G.L c.131A and regulations 321 CMR 10.00) protect rare species and their habitats by prohibiting the "Take" of any plant or animal species listed as Endangered, Threatened, or Special Concern by the MDFW. "Take" is defined as, *"in references to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat."* Permits for taking rare species for scientific, educational, conservation, or management purposes can be granted by the MDFW.

Massachusetts Pesticide Control Act (MGL c.132B)

The purpose of the Massachusetts Pesticide Control Act is "*...to conform the laws of the commonwealth to the* [FIFRA], *Public Law 92-516, as amended,...and to establish a regulatory process in the commonwealth"*. The Act provides "*...exclusive authority in regulating the labeling, distribution, sale, storage, transportation, use and application, and disposal of pesticides in the commonwealth..."*.

Clean Water Act (Section 404)

Section 404 (33 U.S.C. 1344) of the Clean Water Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the United States Army Corps of Engineers unless the specific activity is exempted in 33 CFR 323 or covered by a nationwide permit in 33 CFR 330. The breaching of most beaver dams is covered by these regulations (33 CFR 323 and 33 CFR 330).

Food Security Act

The Wetland Conservation provision (Swampbuster) of the 1985 (16 U.S.C. 3801-3862), requires all agricultural producers to protect wetlands on the farms they own. Wetlands converted to farmland prior to December 23, 1985 were not subject to wetland compliance provisions even if wetland conditions return as a result of lack of maintenance or management. If prior converted cropland is not planted to an agricultural commodity (crops, native and improved pastures, rangeland, tree farms, and livestock production) for more than five consecutive years and wetland characteristics return, the cropland is considered abandoned and then becomes a wetland subject to regulations under Swampbuster and Section 404 of the Clean Water Act. The Natural Resource Conservation Service is responsible for certifying wetland determinations according to this Act.

1.7 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of mammals is the responsibility of the MDFG. As the authority for the management of mammal populations in the Commonwealth, the MDFG was involved in the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency

mandates, policies, and regulations. WS' activities to reduce and/or prevent large rodent damage in the Commonwealth would be coordinated with the MDFG which ensure WS' actions are incorporated into population objectives established for large rodent populations in the State.

Based on the scope of this EA, the decisions to be made are: 1) should WS conduct large rodent damage management to alleviate damage to agriculture, property, natural resources, and threats to human safety, 2) should WS conduct disease surveillance and monitoring in the large rodent population when requested by the MDFG and other agencies, 3) should WS implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for large rodent damage management in Massachusetts, 4) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 5) would the proposed action or the other alternatives result in adverse impacts to the environment requiring the preparation of an EIS.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of SOPs, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop SOPs. Additional descriptions of the affected environment will be incorporated into the discussion of the potential environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Damage or threats of damage can occur statewide in Massachusetts where ever large rodents occur. However, large rodent damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed between WS and a cooperating entity. Those species of large rodents addressed in the assessment can be found throughout the year across the Commonwealth where suitable habitat exists for foraging, loafing, denning, and breeding. Beaver and muskrats are considered semi-aquatic species that are closely associated with freshwater aquatic habitats. Woodchucks are generally associated with open grassy areas in areas where soils allow for burrowing. Porcupines are most often found in forested areas where they feed on and seek shelter in trees.

Upon receiving a request for assistance, large rodent damage management activities could be conducted on federal, Commonwealth, tribal, municipal, and private properties in Massachusetts. The areas of the proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where large rodents may den, dam, fell trees, feed, burrow, or otherwise occur. Examples of areas where large rodent damage management activities could be conducted are, but are not necessarily limited to: agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural areas, government properties and facilities, private properties, corporate properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas. The affected environment could also include areas where large rodents negatively impact wildlife, including T&E species; and public property where large rodents are negatively impacting historic structures, cultural landscapes, and natural resources.

Activities related to large rodent damage management at airports was addressed in a separate EA (USDA 2002). The evaluations of WS' activities to reduce threats associated with large rodents at airports in the Commonwealth will remain as addressed in that assessment (USDA 2002).

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

Issues are concerns of the public and/or professional community raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic FEIS (USDA 1997) and were considered in the preparation of this EA. Those issues are fully evaluated within WS' FEIS which analyzed specific data relevant to WS' programmatic activities at the time of preparation (USDA 1997). Issues related to managing damage associated with large rodents in Massachusetts were developed by WS in consultation with the MDFW. This EA will also be made available to the public for review and comment to identify additional issues.

The issues as those issues relate to the possible implementation of the alternatives, including the proposed action, are discussed in detail in Chapter 4. The issues analyzed in detail in the EA are the following:

Issue 1 - Effects of Damage Management Activities on Large Rodent Populations

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species. Methods available to resolve damage or threats to human safety under the alternatives are categorized into lethal and non-lethal methods.

Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage which reduces the presence of those species at the site and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove a single large rodent or those large rodents responsible for causing damage or posing threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

The analysis for magnitude of impact on populations from the use of lethal methods generally follows the process described in WS' programmatic FEIS (USDA 1997). Magnitude is described in WS' programmatic FEIS as "*...a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management associated with species whose population densities are high and usually only after they have caused damage.

Information on large rodent populations and trends are often derived from several sources including fur harvest reports, control agent reports, damage complaints, ground or aerial surveys, and published literature. There have been no population estimates of beaver made by the MDFW since 2001 after implementation of regulations providing authority for permitting lethal take and use of conibear traps to local Boards of Health. After implementation of the trap ban enacted in 1996, fur harvest of beaver and muskrat declined significantly in the Commonwealth.

Issue 2 - Effects on Non-target Species Populations, Including T&E Species

The issue of non-target species effects, including effects on T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. Methods available for use under

the alternatives are described in Appendix B.

Concerns have also been raised about the potential for adverse effects to occur to non-target wildlife from the use of chemical methods. Chemical methods considered for use to manage damage or threat associated with large rodents includes gas cartridges (sodium nitrate) and aluminum phosphide to fumigate woodchuck burrows, zinc phosphide for woodchucks and muskrats, and repellents which contain various active ingredients. Chemical methods being considered for use to manage damage and threats associated with large rodents in Massachusetts are further discussed in Appendix B.

The ESA states that all federal agencies *"...shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* [Sec. 7(a)(1)]. WS conducts Section 7 consultations with the USFWS to ensure compliance with the ESA and to ensure that *"any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species…Each agency shall use the best scientific and commercial data available"* [Sec. 7(a)(2)].

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. As part of the scoping process and to facilitate interagency cooperation, WS contacted the USFWS during the development of this EA regarding compliance with Section 7 of the ESA. Procedures for compliance with the ESA provided by the USFWS are further discussed in Chapter 4.

Issue 3 - Effects of Damage Management Methods[7] on Human Health and Safety

An additional issue often raised is the potential risks to human safety associated with methods employed to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human safety. WS' employees would use and recommend only those methods which are legally available, selective for target species, and effective to resolve the wildlife conflict. Still, some concerns exist regarding the safety of WS' methods despite their legality and selectivity. As a result, WS will analyze the potential for proposed methods to pose a risk to members of the public or employees of WS.

In addition to the potential risks to the public associated with WS' methods, risks to employees are also an issue. WS' employees are potentially exposed to damage management methods as well as subject to workplace accidents. Selection of methods, as part of an integrated approach, includes consideration for public and employee safety.

Safety of Chemical Methods Employed

The issue of using chemicals methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods would include rodenticides, fumigants, and repellents. Rodenticides are those chemical methods used to lethally take rodents through ingestion of treated bait. Fumigants are used in burrows and act by producing carbon monoxide (gas cartridges when ignited) or phosphine gas (aluminum phosphide). Repellents are chemicals intended to non-lethally discourage use of an area or feeding by causing fear, irritation, or an unpleasant taste or smell.

Currently in Massachusetts, there is one product registered as a repellent for beaver and two products

[7]A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 3), can be found in Appendix B. However, listing methods neither implies that all methods will be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods will be used to resolve every request for assistance.

registered repellents for porcupines. There is one product registered as a toxicant for muskrats and there are 15 products registered to manage damage associated with woodchucks, which includes seven toxicants, three types of gas cartridges, and five repellents.

The most common ingredients of rodent repellents are coyote urine, capsaicin, and pepper oil. Rodenticides available for muskrat and woodchuck include products with zinc phosphide as the active ingredient. Fumigants for woodchuck burrows include products containing sodium nitrate and aluminum phosphide. Chemical methods are further discussed in Appendix B. The use of chemical methods is regulated by the EPA through the FIFRA, the MDAR, and by WS Directives. WS' use of chemical methods is also discussed in WS' programmatic FEIS, including risk assessments (USDA 1997).

Safety of Non-Chemical Methods Employed

Non-chemical methods employed to reduce damage and threats to safety caused by large rodents, if misused, could potentially be hazardous to human safety. Non-chemical methods may include but are not limited to firearms, live-traps, exclusion, cable restraints, body-gripping traps, limited habitat modification, cultural practices, translocation (when permitted), and scaring devices. A complete list of non-chemical methods available to alleviate damage associated with large rodents is provided in Appendix B of this EA.

Effects of Not Employing Methods to Reduce Threats to Human Safety

An issue identified is the concern for human safety from not employing methods or not employing the most effective methods to reduce the threats that large rodents can pose. The risks to human safety from diseases associated with large rodents were addressed previously. The low risk of disease transmission from large rodents does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonoses. Not adequately addressing the threats associated with potential zoonoses could lead to an increase in incidences of injury, illness, or loss of human life. This issue will be fully evaluated in Chapter 4 in relationship to the alternatives.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

One issue is the concern that the proposed action or the other alternatives would result in the loss of aesthetic benefits of target large rodents to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals and birds as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). Those include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived

from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (Bishop 1987). Direct benefits are derived from a personal relationship with animals and may take the form of direct consumptive use (*i.e.*, using parts of or the entire animal) or non-consumptive use (*i.e.*, viewing the animal in nature or in a zoo, photographing) (Decker and Goff 1987).

Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and translocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment. The effects on the aesthetic value of large rodents from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

In contrast, property owners that have large rodents damming, burrowing or feeding on their property are generally concerned about the negative aesthetic appearance of flooding, burrow holes, gnawed and felled trees, and the damage to their homes, buildings, septic systems, and other property. Business owners generally are particularly concerned because negative aesthetics can result in lost business. Costs associated with property damage include labor and supplies to clean and disinfect flooded buildings and septic systems implementation of non-lethal wildlife management methods such as flow control devices, loss of aesthetic value of flowers, gardens, and lawns which may be consumed, loss of personal use, risk of injury, and loss of time contacting local health departments and wildlife management agencies to resolve the health and safety issues.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate damage management for societal benefits could be compatible with animal welfare concerns, if *"…the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

According to the American Veterinary Medical Association (AVMA) (1987), suffering is described as a *"…highly unpleasant emotional response usually associated with pain and distress."* However, suffering *"…can occur without pain…,"* and *"…pain can occur without suffering…"* Because suffering carries with it the implication of a time frame, a case could be made for *"…little or no suffering where death comes immediately…"* (California Department of Fish and Game 1991). Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

Defining pain as a component in humaneness appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain and identifying the causes that elicit pain responses in humans would "*…probably be causes for pain in other animals…*" (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (California Department of Fish and Game 1991).

The AVMA states "*...euthanasia is the act of inducing humane death in an animal*" and "*... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness*" (Beaver et al. 2001). Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild animals. The AVMA states that "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible*" (Beaver et al. 2001).

Pain and suffering, as it relates to methods available for use to manage large rodents has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *"…neither medical nor veterinary curricula explicitly address suffering or its relief"* (California Department of Fish and Game 1991). Research suggests that some methods can cause "*stress*" (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The decision-making process involves trade-offs between the above aspects of pain and humaneness. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering.

An issue often expressed when dealing with aquatic rodent species is the use of drowning methods and the humaneness of drowning. There is considerable debate and disagreement among animal interest groups, veterinarians, wildlife professionals, fur trappers, and nuisance wildlife control specialists on this issue. The debate centers on an uncertainty as to whether the drowning animals are rendered unconscious by high levels of CO_2 and are thus insensitive to distress and pain (Ludders et al. 1999). The issue of humanness and animal welfare concerns, including the use of drowning sets, will be further discussed as it relates to the methods available for use under the alternatives in Chapter 4. SOPs to alleviate pain and suffering are discussed in Chapter 3.

Issue 6 - Effects of Beaver and Muskrat Damage Management on Wetlands

The removal of beaver dams or the installation of water control or exclusionary structures at the dam site are methods often employed to alleviate flooding damage associated with water impounded by a beaver dam. Beaver build dams primarily in smaller riverine systems (intermittent and perennial streams and creeks), irrigation canals, and ditches with dams consisting of mud, sticks, and other vegetative materials. Beaver dams obstruct the normal flow of water and can change the preexisting hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment; the depth of the bottom sediment depends on the length of time an area is covered by water, and the amount of suspended sediment in the water.

Over time, impoundments from beaver dams can lead to soil conditions and vegetative profiles that are consistent with wetland classifications. Under 40 CFR 232.2, a wetland has been defined as "*...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted*

for life in saturated soil conditions."

Impounded water over time can eventually lead to the establishment of hydric soils and the establishment of hydrophytic vegetation. This process can take anywhere from several months to years depending on preexisting conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough to develop anaerobic conditions in the upper part of the soil profile. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

If an area flooded by water impounded by a beaver dam exhibits characteristics that could be defined as a wetland, the removal or the release of water impounded from a beaver dam could result in the loss of habitat.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were also identified by WS and the MDFW during the scoping process of this EA that were considered but will not receive detailed analyses for the reasons provided. The following issues were considered but will not be analyzed in detail:

Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area

A concern was raised that an EA for an area as large as the Commonwealth of Massachusetts would not meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other regulatory agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. Although WS and the MDFW can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage could occur, the program cannot predict the specific locations or times at which affected resource owners would determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions may be categorically excluded (7 CFR 372.5(c)). The intent in developing this EA is to determine if the proposed action would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. This EA addresses impacts for managing damage and threats to human safety associated with large rodents in the Commonwealth to analyze individual and cumulative impacts and to provide a thorough analysis.

In terms of considering cumulative effects, one EA analyzing impacts for the entire Commonwealth would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is made through this EA that the proposed action would have a significant impact on the quality of the human environment, then an EIS would be prepared. Based on previous requests for assistance, the WS program in Massachusetts would continue to conducted large rodent damage management in a very small area of the Commonwealth where damage is occurring or likely to occur.

WS' Impact on Biodiversity

The WS program does not attempt to eradicate or severely suppress any species of native wildlife in the Commonwealth. WS operates in accordance with applicable international, federal, and Commonwealth laws and regulations enacted to ensure species viability. Methods available are employed to target individual large rodents or groups of large rodents identified as causing damage or posing a threat of damage. Any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS operates on a small percentage of the land area in Massachusetts and only targets those large rodents identified as causing damage or posing a threat. Therefore, impacts on biodiversity associated with large rodent damage management would not adversely affect biodiversity in the Commonwealth.

A Loss Threshold Should Be Established Before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. Establishing a threshold would be difficult or inappropriate to apply to human health and safety situations.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied the plaintiffs' motion for a preliminary injunction. In part, the court found that a forest supervisor needs only show that damage from wildlife is threatened, to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for wildlife damage management actions.

Large Rodent Damage Management Should Not Occur at Taxpayer Expense

An issue identified through the development of WS' programmatic FEIS is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based (USDA 1997). Funding for large rodent damage management activities is derived from federal appropriations and through cooperative funding. Activities conducted in the Commonwealth for the management of damage and threats to human safety from large rodents would be funded through cooperative service agreements with individual property owners or associations. A minimal federal appropriation is allotted for the maintenance of a WS program in Massachusetts. The remainder of the WS program is entirely fee-based. Technical assistance is provided to requesters as part of the federally-funded activities, but all direct assistance in which WS' employees perform damage management activities would be funded through cooperative service agreements between the requester and WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by large rodents and that prove to be the most cost effective would receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under

similar circumstance where large rodents are causing damage or posing a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. The cost effectiveness of methods and the effectiveness of methods are linked. The issue of cost effectiveness as it relates to the effectiveness of methods is discussed in the following issue.

Effectiveness of Large Rodent Damage Management Methods

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented, how accurately practitioner's diagnosis the problem, the species responsible for the damage, and how actions are implemented to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible within the limitations of current technology. The most effective approach to resolving any wildlife damage problem is to use an adaptive integrated approach which may call for the use of several management methods simultaneously or sequentially (USDA 1997, Courchamp et al. 2003).

The purpose behind integrated management is to implement methods in the most effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment[8]. Efficacy is based on the types of methods employed, the application of the method, restrictions on the use of the method(s), the skill of the personnel using the method and, for WS' personnel, the guidance provided by WS Directives and policies.

The goal is to reduce damage, risks, and conflicts with wildlife as requested and not to necessarily reduce/eliminate wildlife populations. Localized population reduction could be short-term and new individuals may immigrate or be born to animals remaining at the site (Courchamp et al. 2003). The ability of an animal population to sustain a certain level of removal and to eventually return to pre-management levels does not mean individual management actions are unsuccessful, but that periodic management may be necessary. The return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

A common issue raised is that the use of lethal methods is ineffective because additional large rodents are likely to return to the area, either after removal occurs or the following year when large rodents return to the area which creates a financial incentive to continue the use of only lethal methods. This assumes large rodents only return to an area where damage was occurring if lethal methods are used. However, the use of non-lethal methods is also often temporary which could result in large rodents returning to an area where damage was occurring once those methods are no longer used. The common factor when employing any method is that large rodents would return if suitable conditions continue to exist at the location where damage was occurring and large rodent densities are sufficient to occupy all available habitats to the extent that damage occurs. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B would be temporary if habitat conditions continue to exist that attract large rodents to an area where damage occurs.

Therefore, any method that disperses or removes large rodents from areas would only be temporary if habitat containing preferred habitat characteristics continues to exist. Dispersing large rodents using non-lethal methods addressed in Appendix B often requires repeated application to discourage large rodents from returning to feed, den, or dam building locations which increases costs, moves large rodents to other areas where they could cause damage, and are temporary if habitat conditions at the site remain

[8]The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

unchanged. Dispersing and the translocating of large rodents could be viewed as moving a problem from one area to another which would require addressing damage caused by those large rodents at another location which increases costs and could be perceived as creating a financial incentive to continue the use of those methods since large rodents would have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive or inaccessible to large rodents is discussed in Appendix B. WS' objective is to respond to request for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model to adapt methods in an integrated approach to managing large rodent damage that is agreed upon by the cooperator.

As part of an integrated approach to managing large rodent damage, WS would have the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the alternatives, all methods, individually or in combination that would be available for use, could be employed as deemed appropriate through WS' Decision Model to address requests for assistance. WS' objective when receiving a request for assistance under the proposed action is to reduce damage and threats to human safety or to prevent damage from occurring. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

Managing damage caused by large rodents can be divided into short-term redistribution approaches and long-term population and habitat management approaches (Cooper and Keefe 1997). Short-term approaches focus on redistribution and dispersal of large rodents to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, the use of effigies, adverse noise, erecting access barriers, and repellents (Cooper and Keefe 1997). Population reduction by limiting survival or reproduction, removing large rodents, and habitat modification such as installation of flow control devices are considered long-term solutions to managing damage caused by large rodents (Cooper and Keefe 1997).

Redistribution methods are often employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result. Dispersing large rodents is often a short-term solution that moves large rodents to other areas where damages or threats could occur. Some short-term methods may become less effective in resolving damage as a large rodent population increases, as large rodents become more acclimated to human activity, and as large rodents become habituated to harassment techniques. Non-lethal methods often require a constant presence at locations when large rodents are present and must be repeated every day or night until the desired results are achieved which can increase the costs associated with those activities. Long-term solutions to resolving large rodents damage often require management of the population and identifying the habitat characteristics which attract large rodents to a particular location.

Based on the evaluation of the damage situation, the most effective methods would be employed individually or in combination based on the prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods would be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods is considered as part of the decision making-process under WS' use of the Decision Model described in Chapter 3 for each damage management request based on continual evaluation of methods and results.

Large rodent Damage Should Be Managed by Problem Animal Control Agents and Private Trappers

PAC agents, also known as NWCOs, and private trappers could be contacted to reduce large rodent damage for property owners or when deemed appropriate by the resource owner. Some property owners

would prefer to use a PAC agent or private trapper because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to contract with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues.

Effects of Damage Management Activities on the Regulated Harvest of Large Rodents

Another issue identified is a concern that damage management activities conducted by WS would affect the ability of persons to harvest those species during the regulated hunting and trapping seasons either by reducing local populations through the lethal removal of large rodents or by reducing the number of large rodents present in an area through dispersal techniques. Beaver and muskrats can be harvested during annual trapping seasons in the Commonwealth which are established and regulated by the MDFW. Porcupines and woodchucks may be killed at any time (except during the white-tailed deer (*Odocoileus virginianus*) firearm season) by licensed hunters.

Potential impacts could arise from the use of non-lethal or lethal damage management methods. Non-lethal methods used to reduce or alleviate damage caused by large rodents are used to reduce mammal densities through dispersal in areas where damage or the threat of damage is occurring. Similarly, lethal methods used to reduce damage associated with large rodents could lower densities in areas where damage is occurring resulting in a reduction in the availability of those species during the regulated harvest season. WS' large rodent damage management activities would primarily be conducted on populations in areas where hunting and trapping access is restricted (*e.g.*, airports, urban areas) or has been ineffective. The use of non-lethal or some lethal methods often disperses large rodents from areas where damage is occurring to areas outside the damage area which could serve to move those species from those less accessible areas to places accessible to hunters and trappers.

During the trapping season for beaver and muskrats and during the continuous open season for woodchucks and porcupines, the MDFW allows an unlimited number of the species to be harvested which provides an indication that overharvest is not likely to occur. With oversight of mammal populations by the MDFW, the number of large rodents allowed to be taken by WS would not limit the ability of those persons interested to harvest those species during the regulated seasons. Based on the oversight by the MDFW, WS' take of large rodents annually would have no effect on the ability of those persons interested to harvest large rodents during the regulated harvest season.

Effects on Public Use of Large Rodents

Many people enjoy consumptive and non-consumptive use of wildlife resources in Massachusetts. During 2006, over 2.2 million people participated in wildlife-associated recreation in Massachusetts, including hunting, trapping, and wildlife viewing (USFWS 2007). In pursuit of wildlife-associated recreation, participants contributed $1.6 billion to the economy of Massachusetts for expenses related to travel, equipment, food, licenses, wildlife club memberships, and other associated costs. Because mammals are such a substantial economic and recreational resource, there may be concerns that activities conducted under the alternatives related to managing damage by large rodents might negatively affect those factors.

WS' removal activities would primarily target an individual animal or a small group of animals in a localized area. Densities of target mammals may be reduced temporarily in a localized area after damage management activities have been conducted. WS' does not condone or conduct projects in Massachusetts to eradicate native wildlife populations. This issue was not analyzed in detail since similar analyses were conducted in detail under Issue 1 (effects on target species populations) and Issue 4 (effects on the socio-

cultural and economics of the human environment).

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally take mammals. As described in Appendix B, the lethal removal of large rodents with firearms by WS to alleviate damage or threats would occur using a rifle, air rifle, or shotgun. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). Because of risks to migratory birds and to alleviate concerns associated with lead exposure in wildlife, WS would only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns to take to take beaver, muskrats, porcupines, and woodchucks.

The take of large rodents with firearms by WS in the Commonwealth occurs primarily from the use of rifles. To reduce risks to human safety and property damage from bullets passing through large rodents, the use of rifles is applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through the animal. Large rodents that are removed using rifles would occur within areas where retrieval of all carcasses for proper disposal is highly likely. With risks of lead exposure occurring primarily from ingestion of shot and bullet fragments, the retrieval and proper disposal of large rodent carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through an animal, if misses occur, or if the carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of water, either ground water or surface water, from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (*i.e.*, not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot where it was believed the lead contamination was due to runoff from the parking lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the "*action level*" of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e.*, capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which serves to naturally further reduce the potential for ground or surface water contamination (Craig et al. 1999). These studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities to reduce large rodent damage using rifles, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

WS' assistance with removing large rodents would not be additive to the environmental status quo since those large rodents removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement if a property owner or tenant uses firearms or if firearms are used by PAC agents or validly licensed hunters during the legal season for porcupines and woodchucks. The amount of lead deposited into the environment may be lowered by WS' involvement in large rodent damage management activities due to efforts by WS to ensure projectiles do no pass through but are contained within the large rodent carcass which limits the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that large rodents are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures large rodent carcasses lethally removed using firearms would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures large rodent carcass are removed from the environment to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that are deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from large rodent carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water. As stated previously, when using shotguns, only non-toxic shot would be used by WS. Additionally, WS may use non-toxic rifle bullets if available and effective.

A Site Specific Analysis Should be Made for Every Location Where Large Rodent Damage Management Could Occur

The underlying intent for preparing an EA is to determine if a proposed action might have a significant impact on the human environment. WS' EA development process is issue driven, meaning issues that were raised during the interdisciplinary process and through public involvement that were substantive, were used to drive the analysis and determine the significance of the environmental impacts of the proposed action and the alternatives. Therefore, the level of site specificity must be appropriate to the issues listed.

The analysis in this EA was driven by the issues raised during the scoping process during the development of the EA. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992, USDA 1997) described in Chapter 3 as a site specific tool to develop the most appropriate strategy at each location. The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to wildlife damage management requests.

As discussed previously, one EA analyzing impacts for the entire Commonwealth would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas and allows for a better cumulative impact analysis. If a determination is made through this EA that the proposed action could have a significant impact on the quality of the human environment, then an EIS would be prepared.

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives which were developed to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration based on the issues using the WS Decision model (Slate et al. 1992, USDA 1997). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. SOPs that would guide activities conducted under the alternatives are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

The following alternatives were developed to meet the need for action and to address the identified issues associated with managing damage caused by large rodents in the Commonwealth:

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

The proposed action/no action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by large rodents in Massachusetts. A major goal of the program would be to resolve and prevent large rodent damages and to reduce threats to human health and safety. To meet this goal, WS, in consultation the MDFW, the MDPH, the MDAR, municipal Boards of Health, and Conservation Commissions would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management. Funding could occur through federal appropriations or from cooperative funding. The adaptive approach to managing damage associated with large rodents would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request. City/town managers and health officials, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. Municipal Boards of Health and the MDPH could continue to issue depredation permits and the MDFW and the MDAR could issue appropriate licenses to WS' personnel, licensed trappers, PAC agents, and to those entities experiencing large rodent damage when requested by the entity and when deemed appropriate by the appropriate regulating agency.

Under this alternative, WS could respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by large rodents, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. The take of large rodents can only legally occur through the issuance of a depredation permit issued by municipal Boards of Health or the MDPH, or through licensed hunting and trapping. There are no current take or bag limits in place for those large rodents addressed in Massachusetts.

The Director of the MDFW declares open hunting and trapping seasons for mammals, including where hunting and trapping may occur and makes rules and regulations for hunting and trapping large rodents. Those rules and regulations may include the time and length of the open season, bag and possession limits, methods of taking, time and methods of reporting and all other matters pertaining to such open seasons as they may deem necessary and expedient, and may suspend or modify the open season whenever in their opinion such action becomes necessary. The Director is responsible for issuing PAC licenses and enforcing PAC regulations. The Director may also, without hearing, but with the approval of the Fisheries and Wildlife Board, adopt regulations declared to be emergency regulations necessary for the immediate management or control. Such emergency regulations may be limited in time but shall not remain in effect for a period longer than ninety days. As a result, under this alternative, the Director of MDFW could: 1) deny an application for a depredation permit when requested to alleviate large rodent damage, 2) could issue a depredation permit without take limits or with a pre-determined take limit, 3) restrict or deny authority of PAC agents to take large rodents, 4) restrict or deny authorization to utilize toxicants registered with the MDAR to take large rodents, 5) close or restrict open hunting and trapping seasons for large rodents, including setting daily bag and possession limits, limiting days or times when hunting or trapping can occur, requiring reporting of all take and closing the season when take reaches a

predetermined limit.

Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical non-lethal and lethal techniques. Property owners or managers may choose to implement WS' recommendations on their own (*i.e.*, technical assistance), use contractual services of private businesses such as PAC agents and licensed pest control operators, use volunteer services of private organizations, enter into a cooperative service agreement with WS (*i.e.*, direct operational assistance), or take no action.

A property owner or tenant may choose to utilize their authority to take large rodents causing damage on their property, to authorize their immediate family members, or full time permanent employees to do so (MGL 131-37). Property owners, tenants, or managers may obtain their own hunting, trapping or pesticide applicators certification/license, utilized the services PAC agents or a certified or licensed pesticide applicator or apply for their own depredation permits from the MDFW or a municipal BOH, depending on species causing damage or threats, to lethally take large rodents as authorized by the Code of Massachusetts Regulations (321 CMR).

Permits to take beaver or muskrat may be utilized by property owners or managers or by their authorized agents. Beaver are not considered a PAC species in Massachusetts and may be trapped by any licensed trapper under a municipal BOH or MDPH emergency depredation permit. Licensed PAC agents may take muskrats, woodchucks, and porcupines using legal traps without further permitting.

Similarly, individuals with a Massachusetts Commercial Applicator License may apply registered general use pesticides (gas cartridges for woodchucks and repellents for beaver, porcupine, and woodchucks) and an individual with a Commercial Applicator Certification may apply restricted use and general use pesticides (toxicants for woodchucks and repellents beaver, porcupine and woodchucks) for this purpose. All applications of pesticides to kill or repel large rodents would be conducted in strict accordance with product labels. MGL 131 Section 43 requires a permit issued by the MDFW to use toxicants to take any mammals, with the exception of rats, mice and woodchucks in orchards, near buildings, or underground. At the time this EA was developed, there were no toxicants registered in Massachusetts for taking beaver, porcupines, or muskrats and there were no repellents registered for dispersing muskrats.

Following Municipal BOH or MDFW review of a complete application for a depredation permit from a property owner or manager, a depredation permit could be issued to authorize the lethal take of large rodents as part of an integrated approach. Upon receipt of a depredation permit, the property owner or manager or their authorized agent may commence trapping using authorized trap types for 10 days. If 10 days is insufficient to rectify the issue, a 30 day permit may be requested from the MDFW.

In anticipation of damage management activities involving beaver or muskrat, WS would submit an application for a 10-day depredation permit to the municipal BOH where damage is occurring. Therefore, the municipal BOH could: 1) deny WS' application for a depredation permit, 2) issue a 10-day depredation permit for the take of beaver or muskrats allowing take outside the legal season and/or authorizing use of restricted conibear traps. If the permit is denied, WS could appeal to the MDFW if the permit was denied because the municipal BOH felt that beaver or muskrat were not the species causing damage or to the MDPH if the permit was denied because the municipal BOH did not feel there was a threat to human health and safety as defined in 321 CFR 2:00. WS' personnel could also conduct control of large rodents, depending on species and season by obtaining and maintaining a valid PAC, trapping and/or hunting/sporting license.

WS' Decision Model would be the implementing mechanism for a damage management program under the proposed action alternative that is adapted to an individual damage situation that allows for the

broadest range of methods to be used to address damage or the threat of damage in the most effective, most efficient, and mostly environmentally conscious way available. When a request for direct operational assistance is received to resolve or prevent damage caused by large rodents, WS would conduct site visits to assess damage or threats, identify the cause of the damage, and would apply the decision model described by Slate et al. (1992) and in WS' programmatic FEIS (USDA 1997) to apply methods to resolve or prevent damage using those methods available. The use of the Decision model by WS' employees under the proposed action is further discussed below.

WS would work with those persons experiencing large rodent damage in addressing those large rodents responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as large rodents begin to cause damage. Large rodent damage that has been ongoing can be difficult to resolve using available methods since large rodents are conditioned to feed, burrow, den and dam, and are familiar with a particular location. Subsequently, making that area unattractive through the use of available methods can be difficult to achieve once damage has been ongoing. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

Non-lethal methods include, but are not limited to: habitat/behavior modification, den/burrow disruption or disturbance, flow control devices, visual deterrents, exclusionary devices, frightening devices, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS include: live-capture followed by euthanasia, conibear style quick kill traps, registered toxicants, and shooting. However, listing methods neither implies that all methods would be used or recommended by WS to resolve requests for assistance nor does listing of methods imply that all methods would be used to resolve every request for assistance. The most appropriate response under the proposed action would often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. For example, if an entity requesting assistance has already attempted to alleviate damage occurring using non-lethal methods, WS would not necessarily employ those same non-lethal methods since those methods have been proven to be ineffective.

Euthanasia of live-captured large rodents would occur in accordance with WS Directive 2.505. If shooting is used for euthanization, a single shot to the head is the preferred method. However, if there is a possibility of a human or domestic animal exposure to rabies through a bite or other contact, the target may be shot through the heart so that brain tissue is not damaged and may be tested. Use of euthanasia drugs would only be conducted by WS' personnel trained and certified in their use. Shooting, euthanasia drugs, and carbon dioxide are acceptable forms of euthanasia for large rodents (AVMA 2007).

Lethal and non-lethal methods are intended to be short-term attempts at reducing damage occurring at the time those methods are employed. Long-term solutions to managing large rodent damage would include limited habitat manipulations and changes in cultural practices which are addressed further below and in Appendix B.

Appendix B contains a thorough discussion of the methods available for use in an integrated wildlife damage management approach to address requests for assistance to manage damage or reduce threats to human safety. WS' programmatic FEIS contains additional discussion on adaptive management using an integrated approach to address damage to resources and threats to human safety (USDA 1997). As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those persons experiencing damage associated with large rodents.

Technical Assistance Recommendations

Under the proposed action, WS would provide technical assistance to those persons requesting large rodent damage management as part of an integrated approach to managing damage. Technical assistance would occur as described in Alternative 2 of this EA. Technical assistance is also further discussed in WS' programmatic FEIS (USDA 1997).

The WS program in the Commonwealth regularly provides technical assistance to individuals, organizations, and other federal, Commonwealth, and local government agencies for managing large rodent damage. Technical assistance includes collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues.

Operational Damage Management Assistance

Operational damage management assistance includes damage management activities that are directly conducted by or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and there is a written agreement between WS and the entity requesting assistance. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS' personnel are often required to effectively resolve problems, especially if restricted-use chemicals are necessary or if the problems are complex.

Educational Efforts

Education is an important element of activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, WS provides lectures, courses, and demonstrations to producers, homeowners, Commonwealth and municipal agents, colleges and universities, and other interested groups. Cooperating agencies frequently cooperate with other entities in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that other wildlife professionals and the public are periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development

The National Wildlife Research Center (NWRC) functions as the research unit of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC research biologists work closely with wildlife managers, researchers, and others to develop and evaluate wildlife damage management techniques. NWRC biologists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints which is

depicted by the WS Decision Model (WS Directive 2.201) and described by Slate et al. (1992). WS' programmatic FEIS also provides further discussion and examples of how the Decision Model is used to address damage and threats associated with wildlife (USDA 1997). WS' personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for effectively reducing damage. WS' personnel assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a damage management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model, most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

Community-based Decision Making

The WS program in Massachusetts follows the "*co-managerial approach*" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of large rodents and effective, practical, and reasonable methods available to the local decision-maker(s) to reduce damage or threats. This includes non-lethal and lethal methods. WS, in coordination with Commonwealth and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available. Resource owners and others directly affected by large rodent damage or conflicts in the Commonwealth have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Under a community based decision-making process, WS would provide information, demonstration, and discussion on all available methods to the appropriate representatives of the community for which services were requested to ensure a community-based decision is made. By involving decision-makers in the process, damage management actions can be presented to allow for decisions on damage management to involve those individuals that the decision maker(s) represents. As addressed in the EA, WS would provide technical assistance to the appropriate decision-maker(s) to allow for information on damage management activities to be presented to those persons represented by the decision-maker(s), including demonstrations and presentation by WS at public meetings to allow for involvement of the community. Requests for assistance to manage large rodents often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives, the decision-maker(s) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on large rodent damage management activities. This process allows decisions on large rodent damage management activities to be made based on local input.

Community Decision-Makers

The decision-maker for the local community would be elected officials or representatives of the communities. The elected officials or representatives are popularly elected residents of the local community or appointees who oversee the interests and business of the local community. This person or persons would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making.

Identifying the decision-maker for local business communities is more complex because building owners may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board. WS could provide technical assistance and make recommendations for damage reduction to the local community or local business community decision-maker(s). Direct assistance could be provided by WS only if requested by the local community decision-maker, funding is provided, and if the requested direct control was compatible with WS' recommendations.

Private Property Decision-Makers

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Due to privacy issues, WS can not disclose cooperator information to others. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others are involved in the decision-making process is a decision made by that individual. Direct control would be provided by WS if requested, funding is provided, and the requested management was according to WS' recommendations.

Public Property Decision-Makers

The decision-maker for local, Commonwealth, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. WS would provide technical assistance to this person and recommendations to reduce damage. Direct control would be provided by WS if requested, funding provided, and the requested actions were within the recommendations made by WS.

Examples of WS' Direct Operational and Technical Assistance in Massachusetts

Examples of direct operational assistance and technical assistance projects conducted by WS in Massachusetts to address large rodent damage include:

Management of Damage Caused by Large Rodents at Landfills

WS currently provides technical assistance and consultation, upon request, to landfills in Massachusetts. WS also may assist landfill operators in obtaining municipal BOH and/or MDFW depredation permits for managing large rodents, particularly large rodents. WS uses and recommends damage management strategies for those facilities.

WS may receive requests for assistance in resolving wildlife hazards in the future from landfill operators previously discussed, or any other landfill or trash transfer station in Massachusetts. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate for use at landfills.

Management of Habitat Alteration and Predation of T&E Species by Large Rodents

WS currently provides technical assistance and consultation, upon request, to natural resource managers attempting to enhance or protect T&E species in Massachusetts. WS assists managers in obtaining MDFW depredation permits for managing large rodent predation and habitat alteration. WS uses and recommends management strategies to reduce predation and competition between large rodents and T&E species.

WS may receive requests for assistance in reducing large rodent predation and alteration of habitat required by T&E species in the future from private, municipal, Commonwealth, and federal resource managers in Massachusetts. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate and not likely to adversely affect the T&E species they are intended to support.

Urban/Suburban Large Rodents

WS provides information or services, upon request, to property owners in Massachusetts to reduce the damage associated with beaver, muskrat, woodchuck, and porcupines in urban/suburban environments. WS may assist property owners with obtaining a municipal BOH or MDFW depredation permits for managing these urban/suburban large rodents or may recommend use of PAC agents, pesticide applicators or private trappers. Integrated damage management strategies are recommended and used for these situations.

The main direct control activity used to manage these urban/suburban large rodents, particularly beaver, is trapping and installation of flow control devices. As part of an integrated damage management strategy, WS also recommends harassment, repellants and scare tactics when large rodent damage is identified or construction of new dams, lodges, houses or burrows is observed.

WS may receive requests for assistance in resolving conflicts with large rodents in the future from properties previously discussed, or any other property owners in Massachusetts. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate for use in urban/suburban environments.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with managing damage and threats associated with large rodents with technical assistance only. Technical assistance would provide those cooperators experiencing damage or threats associated with large rodents with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to resolve or prevent damage is the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that are of limited availability for use by private entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those persons experiencing damage or threats associated with large rodents in the Commonwealth.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent large rodent damage as permitted by federal, Commonwealth, and local laws and regulations or those persons could take no action.

Similar to Alternative 1, under this alternative, municipal Boards of Health, MDFW, and MDPH could issue permits requested by those entities experiencing damage or could deny the issuance of permits. WS

could provide technical assistance to those persons applying for permits under this alternative by assisting with filling out forms, making recommendations to achieve damage or threat reduction; provide information on damage management activities that could be employed, or by the loaning of equipment. Under the technical assistance only alternative, WS would not be directly involved with the take of large rodents in the Commonwealth and therefore, would not apply for a depredation permit or applicable licenses from municipal Boards of Health, MDFW, MDPH, or the MDAR. If a person experiencing large rodent damage receives technical assistance from WS, the property owner or manager experiencing large rodent damage or threats could: 1) take no further action, 2) use non-lethal methods only, 3) apply for a depredation permit that would allow for the lethal take of large rodents, 4) purchase or obtain applicable hunting, trapping, PAC or pesticide licensing that would allow for lethal take of large rodents, 5) hire or request assistance from a PAC agent, licensed pesticide applicator or licensed trapper 6) lethally take large rodents on property they own or are a tenant on, or authorize their immediate family member or full time employee to take using legal lethal means such as shooting or box traps, or 7) take illegal action and lethally take large rodents without a depredation permit or appropriate licenses or on the property of another despite WS' recommendations.

Alternative 3 – No Large rodent Damage Management Conducted by WS

This alternative precludes any and all activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of large rodent damage management in the Commonwealth. All requests for assistance received by WS to resolve damage caused by large rodents would be referred to a municipal BOH, municipal animal control officers, the MDFW, the MDPH, and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with large rodents in the Commonwealth, those persons experiencing damage caused by large rodents could continue to resolve damage by employing those methods legally available since the take of large rodents can occur through the issuance of depredation permits by the MDFW, municipal BOH, MDPH and hunting/trapping licenses issued by the MDFW and MDAR or by hiring a PAC agent, licensed pesticide applicator or private trapper. All methods described in Appendix B would be available for use by those persons experiencing damage or threats.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

In addition to those alternative analyzed in detail, several other alternatives were identified during the initial scoping process for the EA. Those alternatives are addressed below but will not be analyzed in detail for the reasons provided.

Non-lethal Methods Implemented Before Lethal Methods

This alternative would require that all non-lethal methods or techniques described in Appendix B be applied to all requests for assistance to reduce damage and threats to safety from large rodents in the Commonwealth. If the use of all non-lethal methods fails to resolve the damage situation or reduce threats to human safety at each damage situation, lethal methods would be employed to resolve the request. Non-lethal methods would be applied to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by those persons experiencing large rodent damage.

Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS. Verification of the methods used would be the responsibility of WS. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how

many non-lethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods can be evaluated. The proposed action described (Alternative 1) is similar to a non-lethal before lethal alternative because the use of non-lethal methods is considered before lethal methods by WS (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

Use of Non-lethal Methods Only by WS

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by large rodents in the Commonwealth. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of large rodents would occur by WS. The use of lethal methods could continue to be used under this alternative by those persons experiencing damage by large rodents when permitted by a municipal BOH, the MDFW, the MDPH, or otherwise legally allowed. Exclusionary devices can be effective in preventing access to resources in certain circumstances. Exclusion is most effective when applied to small areas to protect high value resources. However, exclusionary methods are neither feasible nor effective for protecting human safety, agriculture, or native wildlife species from large rodents across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives. Non-lethal methods would be employed by WS in an integrated approach under this alternative.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS would refer requests for information regarding lethal information to the MDFW, the MDPH, municipal BOH, municipal animal control agent, or private businesses or organizations. Under this alternative; however, property owners/managers might be limited to using non-lethal methods only as they may have difficulty obtaining permits for lethal methods, especially in urban areas. Property owners or managers could conduct management using shooting or any lethal method that is legal. Property owners or managers might choose to implement WS' non-lethal recommendations, implement lethal methods, or request assistance from private or public entity other than WS. Property owners/managers frustrated by lack of WS' assistance with the full range of large rodent damage management techniques may try methods not recommended by WS (*e.g.*, toxicants not registered for use on large rodents). In some cases, property owners or managers may misuse some methods or use some methods in excess of what is necessary.

The proposed action, using an integrated damage management approach, incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods would effectively resolve damage from large rodents those methods would be used or recommended under the proposed action. For those requests that can be resolved using non-lethal methods as determined by WS through the use of the WS Decision Model, WS would employ or recommend only non-lethal methods under the proposed action. Since non-lethal methods would be available for use under the alternatives analyzed in detail, this alternative would not add to the analyses.

Use of Lethal Methods Only by WS

This alternative would require the use of lethal methods only to reduce threats and damage associated with large rodents. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Non-lethal methods have been effective in alleviating large rodent damage. In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Translocate Large Rodents Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Currently it is illegal to translocate wildlife in Massachusetts without the authorization of the Director of the MDFW. With such authorization, large rodents could be live-captured using hand capture, live-traps, or other lawful methods. All large rodents live-captured through direct operational assistance by WS could be translocated. Large rodents could be translocated within Massachusetts or translocated to another state or country. If conducted within Massachusetts, translocation sites would be identified and have to be approved by the MDFW and/or the property owner where the translocated large rodents would be placed prior to live-capture and translocation. Translocation to another state or country would require at a minimum authorization from the MDFW and the appropriate wildlife management agency in the state or country accepting the translocated animals as well as any required federal or international permits, authorizations, health evaluations and vaccinations.

The translocation of large rodents by WS would only occur as directed by the MDFW. When and if requested by the MDFW or an outside wildlife management agency in cooperation with the MDFW, WS could translocate large rodents under any of the alternatives analyzed in detail, except for the no involvement by WS alternative. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. However, WS does not have the authority to translocate large rodents in the Commonwealth unless permitted by the MDFW; this alternative was not considered in detail since translocation of large rodents could occur under any of the alternatives analyzed in detail.

Translocation of large rodents causing damage to other areas following live-capture generally would not be effective or cost-effective. Translocation of mammals is generally ineffective because problem mammal species are mobile and may return to damage sites, habitats in other areas are generally already occupied, and translocation would most likely result in mammal damage problems at the new location. Also, hundreds of large rodents may need to be captured and translocated to solve some damage problems; therefore, translocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats (Nielsen 1988).

Reducing Damage by Managing Large Rodent Populations through the Use of Reproductive Inhibitors

Under this alternative, the only method available to resolve requests for assistance would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in large rodents responsible for causing damage which would require special permitting from the MDFW. Reproductive inhibitors are often considered for use where wildlife populations are overabundant and where lethal control programs are not publicly acceptable (Muller et. al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors.

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through: 1) hormone implantation (synthetic steroids such as progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily).

Chemosterilants have been evaluated as a means of managing beaver populations (Davis 1961, Arner 1964). Quinstrol and mestranol have been proposed for use to manage beaver populations (Gordon and Arner 1976, Wesley 1978). While chemosterilants have been shown to reduce beaver reproduction in controlled experiments, there are no practical, effective methods for distributing chemosterilants in a consistent way to wild, free ranging beaver populations (Hill et al. 1977, Wesley 1978). Although those methods were effective in reducing beaver reproduction by up to 50%, the methods were not practical or were too expensive for large-scale application.

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Currently, no reproductive inhibitors are available for use to manage large rodent populations. Given the costs associated with live-capturing and performing sterilization procedures on large mammals and the lack of availability of chemical reproductive inhibitors for the management of large rodent populations, this alternative was not evaluated in detail. If a reproductive inhibitor becomes available to manage large rodent populations and has proven effective in reducing localized large rodent populations, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage. This EA would be reviewed and supplemented to the degree necessary to evaluate the use of the reproductive inhibitor as part of an integrated approach described under the proposed action.

Compensation for Large rodent Damage

The compensation alternative would require WS to establish a system to reimburse persons impacted by large rodent damage. Under such an alternative, WS would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS would conduct site visits to verify damage. Analysis of this alternative in WS' programmatic FEIS indicated that a compensation only alternative had many drawbacks. Compensation would: 1) require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation, 2) most likely be below full market value, 3) give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies, and 4) not be practical for reducing threats to human health and safety.

Establish Bounties for Large Rodents in the Commonwealth

Payment of funds (bounties) for killing some mammals suspected of causing economic losses have not been supported by Massachusetts state agencies, such as the MDFW, as well as most wildlife professionals for many years (Latham 1960, Hoagland 1993). WS concurs with those agencies and wildlife professionals because of several inherent drawbacks and inadequacies in the payment of bounties, including: 1) bounties are generally ineffective at controlling damage, especially over a wide area such as Massachusetts, 2) circumstances surrounding the take of animals are typically arbitrary and completely unregulated, 3) it is difficult or impossible to assure animals claimed for bounty were not taken from outside the damage management area, and 4) WS does not have the authority to establish a bounty program.

Use of Live-capture methods only with Beaver Euthanized after Capture

Under this alternative, only non-lethal methods available for the capture of beaver (*e.g.*, suitcase traps, snares, foothold traps) would be employed. After capture, beaver would be euthanized using methods

considered appropriate to euthanize free-ranging wildlife by the American Veterinary Medical Association. Methods of euthanasia considered appropriate by the AVMA for free-ranging wildlife include barbiturates, carbon dioxide, and gunshot (AVMA 2007).

WS' directives require the use of euthanasia methods that conform to guidelines published by the AVMA for live-captured wildlife whenever possible (WS Directive 2.505). Under the proposed action, WS would employ those live-capture methods that would be available under this alternative. Those methods available to euthanize live-captured beaver under this alternative would be available for use under the proposed action. Therefore, the analyses of methods and euthanasia methods under this alternative would be available under the proposed action and would not add to the analyses.

3.3 STANDARD OPERATING PROCEDURES FOR DAMAGE MANAGEMENT TECHNIQUES

SOPs improve the safety, selectivity, and efficacy of wildlife damage management activities. The current WS program, nationwide and in the Commonwealth of Massachusetts, uses many such SOPs which are discussed in detail in Chapter 5 of WS' programmatic FEIS (USDA 1997). Those SOPs would be incorporated into activities conducted by WS when addressing large rodent damage and threats in the Commonwealth.

Some key SOPs pertinent to the proposed action and alternatives include the following:

- The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, would be consistently used and applied when addressing large rodent damage.

- EPA-approved label directions would be followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects to the environment when chemicals are used in accordance with label directions.

- Non-target animals captured in traps would be released unless it is determined that the animal would not survive and/or that the animal cannot be released safely.

- The presence of non-target species would be monitored before using toxicants to reduce the risk of mortality of non-target species' populations.

- WS would consult the USFWS NEFO and the MDFW NHESP websites to determine if federally and state listed species could be present at project sites. If listed species could be present, the USFWS and/or MDFW would be contacted to determine if listed species are likely to be present at project sites during the period the project is to be conducted. If federally listed species are or could be present, an informal or formal Section 7 Consultation will be conducted with the USFWS. If state listed species are or could be present, consultation with the MDFW will be made.

- All personnel who use chemicals would be trained and certified to use such substances or are supervised by trained or certified personnel.

- All personnel who use firearms would be trained according to WS' Directives.

- The use of non-lethal methods would be considered prior to the use of lethal methods when managing large rodent damage.

- WS would employ methods and conducts activities for which the risk of hazards to public safety and hazards to the environment have been determined to be low according to a formal risk assessment (USDA 1997). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

- Immobilizing and euthanasia drugs would be used according to the Drug Enforcement Administration (DEA), FDA, and WS' program policies and directives and procedures are followed that minimizes pain.

- WS' employees would follow approved procedures outlined in WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001).

- Pesticide and controlled substance use, storage, and disposal would conform to label instruction and other applicable laws and regulations, and Executive Order 12898.

- Material Safety Data Sheets for pesticides and controlled substances would be provided to all WS' personnel involved with specific damage management activities.

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

Issue 1 - Effects of Damage Management Activities on Large Rodent Populations

- Lethal take of large rodents by WS would be monitored to assist in evaluating population trends and the magnitude of WS' take of large rodents in the Commonwealth.

- WS**'** take would be reported to the MDFW to ensure take occurs within allowable limits to meet population objectives for target mammal species.

- WS would only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.

- The WS' Decision Model, designed to identify the most appropriate damage management strategies and their impacts, would be used to determine large rodent damage management strategies.

- Preference would be given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods were not available and if lethal control methods were available and appropriate for WS to implement, WS may implement lethal methods.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

- WS' personnel would be trained and experienced to select the most appropriate method for taking problem animals and excluding non-targets. For example, WS' personnel would utilize pan tension devices or would alter trap triggers in order to exclude or reduce the capture of non-target species.

- When conducting removal operations via shooting, identification of the target would occur prior to application.

- As appropriate, suppressed firearms would be used to minimize noise impacts.

- Personnel would use lures, trap placements, and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.

- Any non-target animals captured in cage traps or any other restraining device would be released whenever it is possible and safe to do so.

- Personnel would check all live-traps (box or suitcase type) a minimum of once a day and would release any non-target species captured.

- WS would consult with the MDFW and the USFWS to evaluate activities to resolve large rodent damage and threats to ensure the protection of T&E species.

- WS would monitor activities conducted under the selected alternative, if activities are determined to have no significant impact on the environment and an EIS is not required, to ensure those activities do not negatively impact non-target species

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

- Damage management activities would be conducted professionally and in the safest manner possible. Most activities would be conducted away from areas of high human activity. If this is not possible, then activities would be conducted during periods when human activity is low (*e.g.*, early morning).

- Shooting would be conducted during time periods when public activity and access to the control areas are restricted. Personnel involved in shooting operations would be fully trained in the proper and safe application of this method.

- All personnel employing chemical methods would be properly trained and certified in the use of those chemicals. All chemicals used by WS would be securely stored and properly monitored to ensure the safety of the public. WS' use of chemicals and training requirements to use those chemicals are outlined in WS Directive 2.401, WS Directive 2.405, and WS Directive 2.430.

- All chemical methods used by WS or recommended by WS would be registered with the EPA and the MDAR and conducted under MDFW permits for wildlife immobilization.

- Carcasses of large mammals retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

- Management actions to reduce or prevent damage caused by large rodents would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- All methods or techniques applied to resolve damage or threats to human safety would be agreed upon by entering into a cooperative service agreement, MOU, or comparable document prior to the implementation of those methods.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

- Personnel would be well trained in the latest and most humane devices/methods for removing problem large rodents.

- WS' use of euthanasia methods would follow those recommended by WS Directive 2.430 and WS Directive 2.505.

- The NWRC would be continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.

Issue 6 - Effects of Beaver and Muskrat Damage Management on Wetlands

- WS' beaver dam removal activities or flow control device installation would only be conducted to restore the flow of water through drainages, streams, creeks, canals, and other water courses where flooding damage has occurred or would occur.

- Upon receiving a request to remove a beaver dam or dams as defined in 321 CMR 3.02(5), WS would visually inspect the dam and the associated water impoundment to determine if characteristics exists at the site that would meet the definition of a wetland under section 404 of the Clean Water Act (40 CFR 232.2). If wetland conditions are present at the site, the entities requesting assistance from WS would be notified that a permit may be required to remove the dam and to seek guidance from the Municipal Conservation Commissions and the United States Corps of Engineers pursuant to Massachusetts State Law and the Clean Water Act. No beaver dam, beaver lodge, or muskrat lodge would be torn open, disturbed, or destroyed except as provided in 321 CMR 2.08.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified. The following resource values in the Commonwealth are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, the proposed action/no action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives.

Issue 1 - Effects of Damage Management Activities on Large Rodent Populations

A common issue is whether damage management actions would adversely affect the populations of target mammal species, especially when lethal methods are employed. WS maintains ongoing contact with the MDFW to ensure activities are within management objectives for those species. The MDFW monitors the total take of mammals from all sources and factors in survival rates from predation, disease, and other mortality data. Ongoing contact with the MDFW assures local, state, and regional knowledge of wildlife population trends are considered. As discussed previously, the analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest trend data. WS' take would be monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take would be maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997).

As was discussed previously, methods available to address large rodent damage or threats of damage in the Commonwealth that would be available for use or recommendation under Alternative 1 (technical and operational assistance) and Alternative 2 (technical assistance only) are either lethal methods or non-lethal methods. Under Alternative 2, WS would recommend lethal and non-lethal methods as part of an integrated approach to resolving requests for assistance. Alternative 1 addresses requests for assistance received by WS through technical and operational assistance where an integrated approach to methods would be employed and/or recommended. Non-lethal methods include, but are not limited to: habitat/behavior modification, visual deterrents, live traps, translocation, cable restraints, exclusionary devices, frightening devices, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS to address mammal damage include: live-capture followed by euthanasia, shooting, body-gripping traps, fumigants, rodenticides, cable restraints, and the recommendation of hunting and/or trapping, where appropriate. Euthanasia would occur through the use of euthanasia drugs or carbon dioxide once large rodents are live-captured using other methods. In addition, gunshot could be employed to euthanize live-captured wildlife. No assistance would be provided by WS under Alternative 3 but many of those methods available to address large rodent damage would continue to be available for use by other entities under Alternative 3.

Non-lethal methods can disperse or otherwise make an area unattractive to large rodents causing damage; thereby, reducing the presence of large rodents at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model, primarily if non-lethal methods have been employed by the cooperator and have proven to be ineffective in resolving damage or threats to a level acceptable to the cooperator.

Non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse large rodents from the area resulting in a reduction in the presence of those large rodents at the site where those methods were employed. However, large rodents responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. Non-lethal methods are not employed over large

geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed. The use of non-lethal methods would not have adverse impacts on large rodent populations in the Commonwealth under any of the alternatives.

The continued use of non-lethal methods often leads to the habituation of wildlife species to those methods which can decrease the effectiveness of those methods. For any management methods employed, the proper timing is essential in effectively dispersing those large rodents causing damage. Employing methods soon after damage begins or soon after threats are identified increases the likelihood that those damage management activities will achieve success. Therefore, coordination and timing of methods is necessary to be effective in achieving expedient resolution of large rodent damage.

Lethal methods would be employed or recommended to resolve damage associated with those large rodents identified by WS as responsible for causing damage or threats to human safety only after receiving a request for the use of those methods. The use of lethal methods could result in local population reductions in the area where damage or threats were occurring since large rodents would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove large rodents that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would result in local reductions of large rodents in the area where damage or threats were occurring. The number of large rodents removed from the population using lethal methods would be dependent on the number of requests for assistance received, the number of large rodents involved with the associated damage or threat, and the efficacy of methods employed.

Most lethal methods are intended to reduce the number of large rodents present at a location since a reduction in the number of large rodents at a location leads to a reduction in damage which is applicable whether using lethal or non-lethal methods. The intent of non-lethal methods is to harass, exclude, or otherwise make an area unattractive to large rodents which disperses those large rodents to other areas which leads to a reduction in damage at the location where those large rodents were dispersed. The intent of using lethal methods is similar to the objective trying to be achieved when using non-lethal methods which is to reduce the number of large rodents in the area where damage is occurring which can lead to a reduction in the damage occurring at that location.

Although the use of firearms can reduce the number of large rodents using a location (similar to dispersing large rodents), the use of a firearm is most often used to supplement and reinforce the use associated with non-lethal methods. The capture of large rodents using live-traps and subsequently euthanizing those rodents is employed to reduce the number of rodents using a particular area where damage is occurring. Similarly, the recommendation that large rodents be harvested during the regulated hunting and/or trapping season for those species in the Commonwealth is intended to manage those populations in an area where damage is occurring.

Often of concern with the use of lethal methods is that large rodents that are lethally taken would only be replaced by other large rodents either during the application of those methods (either from other large rodents that migrate into the area) or by large rodents the following year (increase in reproduction that could result from less competition). As stated previously, the use of lethal methods are not intended to be used as population management tools over broad areas. The use of lethal methods are intended to reduce the number of large rodents present at a location where damage is occurring by targeting those large rodents causing damage or posing threats which is similar to the use of non-lethal methods where the intent is to disperse mammals from an area. Since the intent of lethal methods is to manage those large rodents causing damage and not to manage entire large rodent populations, those methods are not

ineffective because removed large rodents are replaced by other large rodents at a later time.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing large rodent damage. Those methods are intended to reduce damage occurring at the time those methods are employed but do not necessarily ensure large rodents would not return once those methods are discontinued or the following year when large rodents return. Long-term solutions to resolving large rodent damage are often difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as fencing with buried skirting, flow control devices, hardware cloth or sheet metal wrapped around tree trunks or other practices. When addressing large rodent damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to large rodents. To ensure complete success, alternative sites in areas where damage is not likely to occur are often times required to achieve complete success in reducing damage and avoid moving the problem from one area to another. Modifying a site to be less attractive to large rodents would likely result in the dispersal of those large rodents to other areas where damage could occur or could result in multiple occurrences of damage situations.

WS may recommend large rodents be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of rodents causing damage. Managing large rodent populations over broad areas could lead to a decrease in the number of rodents causing damage. Establishing hunting and trapping seasons and the allowed take during those seasons is the responsibility of the MDFW. WS does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons. However, the harvest of those large rodents with hunting and/or trapping season in the Commonwealth would be occurring in addition to any take that could occur by WS under the alternatives or recommended by WS.

In 1996, Massachusetts voters approved Question 1 which prohibited the use of foothold traps and snares with 64.3% of voters in favor. The beaver population at the time was estimated at 24,000 in the Commonwealth with a population goal of 18,000 beaver. Within five years of implementation, in 2001, the MDFW estimated the population at 70,000 individuals. This was the last time the population was estimated by the MDFW. In 2000, Question 1 was amended to grant authority to municipal BOH to issue 10-day emergency permits to take beaver and muskrat causing threats to human health and safety or threat of significant property damage to structures and agriculture outside the trapping season and for use of conibear type traps. Provisions for appealing denial of permits to the MDPH and MDFW were included as well as provisions for obtaining additional permits. Municipal Conservation Commissions in Massachusetts have the authority to authorize beaver dam breeching and/or removal as well as installation of flow control devices. There are no current population estimates available for muskrat, woodchucks, or porcupines. Those species are generally considered common and abundant and there are no harvest limits in place.

The issue of the potential impacts of conducting the alternatives on the populations of those large rodent species addressed in this assessment is analyzed for each alternative below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance to those persons requesting assistance with managing damage and threats associated with large rodents in the Commonwealth. WS could employ those methods described in Appendix B in an adaptive approach that would integrate methods to effectively reduce damage and threats. WS' proposed action incorporates an adaptive approach to resolve damage and reduce threats to human safety by targeting individual rodents or groups of rodents using non-lethal and lethal methods after applying the WS'

Decision Model (Slate et al. 1992, USDA 1997) to identify possible techniques. As stated previously, the use of non-lethal methods under the proposed action would not reach a magnitude where dispersal would cause adverse effects by limiting access of entire wildlife populations or large portions of populations to habitat or food sources. Requests for assistance and the subsequent activities conducted by WS would only occur on a small portion of the total land area of Massachusetts. Therefore, the use of non-lethal methods under the proposed action would not adversely affect large rodent populations in the Commonwealth.

Of concern is the use of lethal methods that results in the take of large rodents in areas where damage is occurring and a request for such activities is received by WS. The lethal take of large rodents by WS or any other entity can only occur pursuant to depredation permits or licenses issued under authority of the MGL Chapter 131 Inland Fisheries and Game and Other Natural Resources and Chapter 132B Massachusetts Pesticide Control Act and regulated under 321 CMR and 333 CMR. Lethal take would result in the removal of those large rodents identified as causing damage or posing threats. Therefore, localized reductions in the number of large rodents would occur from the use of lethal methods.

The MDFW monitors the take of large rodents from transactions involving beaver pelts and annual PAC agent reports. Ongoing contact with the MDFW assures local, Commonwealth, and regional knowledge of wildlife population trends are considered. While local populations of large rodents may be reduced, compliance with applicable Commonwealth and federal laws and regulations authorizing take of large rodents and the alteration or removal of beaver dams would ensure that the regional and statewide populations would not be adversely affected.

Beaver Population Impact Analysis

The North American beaver is a semi-aquatic mammal occurring in rivers, streams, lakes, reservoirs, and wetlands across North America. Beaver are large, bulky rodents whose most prominent features include a large scaly, paddle-shaped tail and orange-colored incisors (Hill 1982). Most adults weigh from 15.8 to 38.3 kg (35 to 50 lbs) with some occasionally reaching more than 45 kg (100 lbs) and are the largest North American rodents (Miller and Yarrow 1994). They range in most of Canada and the United States, with the exception of portions of Florida and the desert southwest. Beaver are active throughout most of the year and are primarily nocturnal, but it is not uncommon to see them during the daylight hours. Beaver living along a river or large stream generally make bank burrows with multiple underwater entrances. Those in smaller streams, lakes, and ponds usually build dams and a lodge (National Audubon Society 2000).

Beaver are unique in their ability to create and modify their habitat by building dams (Boyle and Owens 2007). Beaver have a wide range and are extremely abundant, being found widely distributed over much of North America, including most of the United States. Beaver were trapped extensively during the 19th and part of the 20th century and as a result, disappeared from much of their range (Novak 1987). Now reestablished over most of the North American continent and protected from overexploitation, the beaver population has exceeded the societal carrying capacity in some areas. Dams built and maintained by beaver may flood stands of commercial timber, highways, and croplands. However, the dams also help reduce erosion and the ponds formed by the dams may create a favorable habitat for many forms of life (Hill 1982). In Massachusetts, beaver can be found across the Commonwealth with the exception of Dukes and Nantucket Counties (MDFW 2007*a*). They are considered common and abundant; however they are less common in southeastern Massachusetts than in other areas of the Commonwealth.

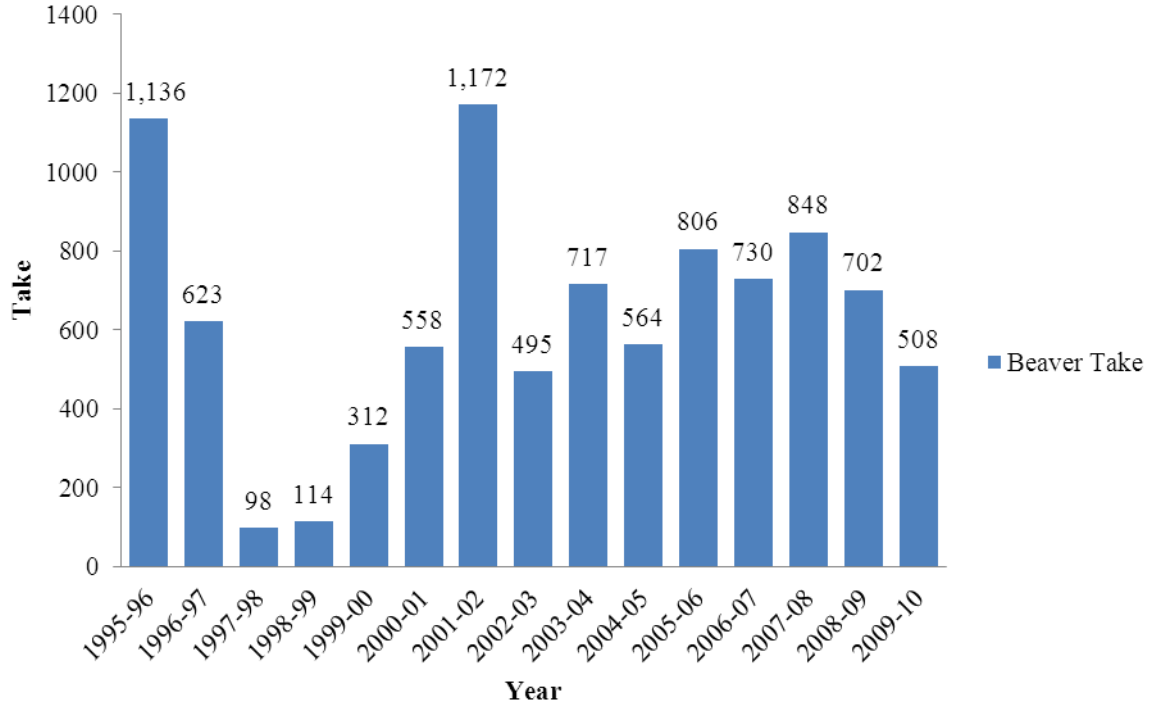
Beaver family groups are typically comprised of two adult parents with two to six offspring from the current or previous breeding season. Average family group size has been documented as ranging from 3.0 to 9.2 beaver (Novak 1987). Beaver abundance has been reported in terms of families per kilometer

of stream or per square kilometer of habitat. Novak (1987) summarized beaver family abundance, with reported estimates ranging from 0.31 to 1.5 families per kilometer of stream (0.5 to 2.4 families per mile of stream), equating to 0.15 to 3.9 families per square kilometer (0.24 to 6.3 families per square mile).

Beaver populations increased drastically in Massachusetts after implementation of a ban on the use of foothold traps and restrictions on the use of body-gripping traps. As shown in Figure 4.1, a decline of over 45% in the number of beaver harvested in the Commonwealth occurred from the 1995-1996 season (1,136) to the 1996-1997 season (623) after the trap ban was passed. The harvest during the 1997-1998 season dropped to 98 beaver, a decline of over 91% from the 1995-1996 harvest. The annual harvest of beaver did eventually reach levels seen before the trap ban but did not keep pace with the estimated population increase.

Figure 4.1 shows the Massachusetts beaver harvest from the 1995-1996 trapping season to the 2009-2010 trapping season and includes some salvaged beaver pelts. Figure 4.2 shows take under emergency permits in the Commonwealth from calendar years 2000 to 2009. Trapping harvest and depredation take figures are not currently available for 2010 and 2011. Some depredation that occurred during the legal trapping season may have resulted in pelts being tagged and individual beavers being reported in both data sets.

Figure 4.1 – Harvest and salvage of beaver in Massachusetts during the trapping season, 1995-96 to 2009-10 (L. Hajduk, MDFW pers. comm. 2011)



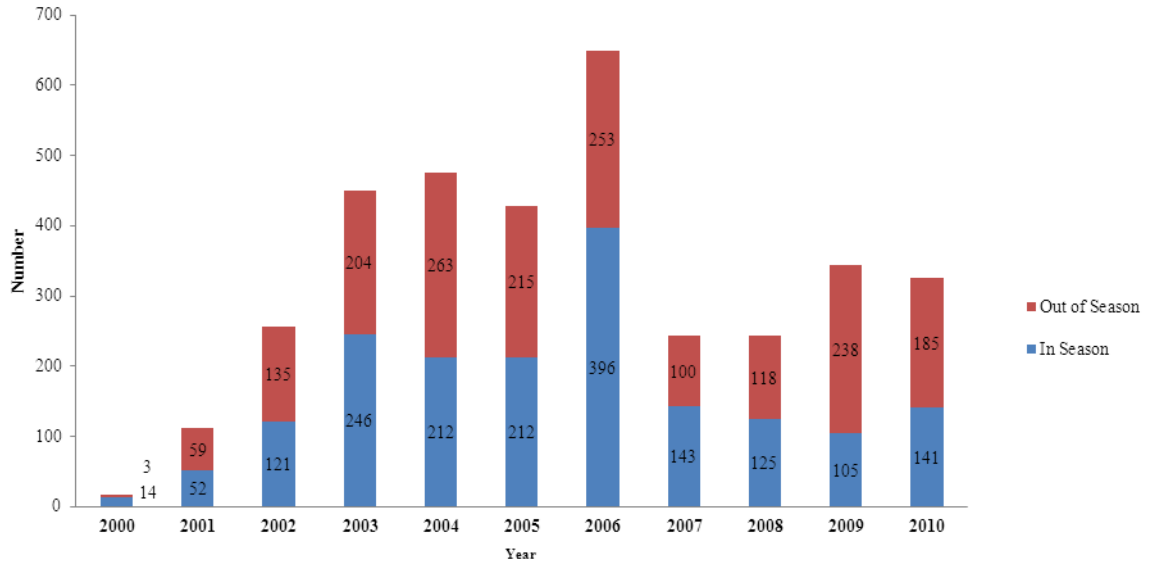
Due to the transfer of jurisdiction to the city and town health departments that occurred in 2000, the current population of beaver in the Commonwealth is currently unknown. The statewide population for beaver in Massachusetts was estimated at 70,000 beaver in 2001, up from an estimated 24,000 beaver in 1996 prior to the restrictions on trapping (L. Hajduk, MDFW pers. comm. 2009). Biologists from the MDFW indicate an increasing beaver population within the Commonwealth (L. Hajduk, MDFW pers. comm. 2009). Regulation of trapping and available trap types, protection of wetland habitat, natural dispersal, and population increases have resulted in beaver populations in most suitable habitat in the Commonwealth. The beaver is classified as a furbearer in Massachusetts and is managed for commercial

harvest.

Beaver have a relatively low biotic potential due to small litter size and a long juvenile development period. Population matrix models showed that survival of kits (1st year juveniles) and yearlings (2nd year juveniles) is the most critical factor in population viability. Survival of those age classes is partly dependent on the ability of beaver to successfully disperse and re-colonize habitats. Beaver are strong dispersers, and populations can recover quickly from local reductions when dispersal corridors are maintained (Boyle and Owens 2007).

Coyotes (*Canis latrans*), black bears (*Ursus americanus*), bobcats (*Lynx rufus*), fishers (*Mustela pennanti*), red fox (*Vulpes vulpes*), river otters (*Lontra canadensis*), mink (*Mustela vison*), and large raptors such as hawks and owls have been documented preying on beaver and occur in Massachusetts (Tesky 1993, Baker and Hill 2003, Jackson and Decker 2004). With the exception of coyote, bear, and bobcat predation, most predation likely occurs to kits, yearlings, and young adults. With little exception, these predator species do not appear to exert significant predation pressure on beaver populations (Baker and Hill 2003).

Figure 4.2 – Beaver take under emergency permits by non-WS entities in Massachusetts, 2000–2011 (L. Hajduk, MDFW pers. comm. 2011)*



*This number may include beaver that were tagged at MDFW check stations and therefore, some are likely included in the estimated season harvest.

Beaver were first rediscovered in Massachusetts in 1928 after having been extirpated in 1750. The beaver population grew to 300 individuals, in 45 colonies, by 1946 and by 1952 regulations were in place to allow for the regulated harvest of beaver. Under regulated harvest, the beaver population grew to an estimated 24,000 beaver in 1996. Based on the 1946 and 1996 population estimates, the beaver population in Massachusetts grew at an average annual rate of 9.4% during this 50-year period, despite the existence of a regulated harvest season. Based on this rate of increase, regulated human trapping activity and natural mortality were insufficient to control population growth in the Commonwealth even before the passage of Question 1 in 1996. However, the population growth rate during this period was much lower than the growth rates following the passage of Question 1.

After implementation of Question 1, the Massachusetts beaver population experienced extreme growth rising from an estimated 24,000 beaver to 70,000 beaver in only five years based on estimates provided by the MDFW (MDFW 2007*b*). In response to increasing conflicts between beaver and people, the Massachusetts Legislature modified Question 1 in 2000 and gave the local Boards of Health authority to issue emergency permits that allow the use of restricted traps and trapping outside the regulated trapping season (MDFW 2010).

Beaver are managed as furbearers by the MDFW with annual trapping seasons. Take can occur by licensed trappers during the regulated season using approved box or cage type traps or suitcase type traps such as Bailey traps and Hancock traps. Use of suitcase traps requires special training and certification from the MDFW. Landowners, their immediate family members or employees may take beaver on their property that are causing or threatening to cause damage year round. They may use cage traps, suitcase traps with certification, or with firearms which requires a Firearms Identification (FID) card or License to Carry (LTC) firearms permit. Pelts of beaver harvested by lawful methods or salvaged during the legal season that are to be sold or transferred out of state must be sealed within four days of the end of the beaver trapping season in Massachusetts. Sealing involves having a tag affixed to the pelt at an official furbearer check station. Sealing is the primary method used by the MDFW to track beaver harvest during the trapping season.

In Massachusetts, licensed PAC agents are authorized to handle wildlife damage or threats to human health and safety from a defined list of species through lethal methods both in and outside regulated trapping seasons. This list includes the other species addressed in this EA and many other furbearers and/or game species found in Massachusetts. Beaver are not on this list and are not covered under PAC regulations. Any properly licensed trapper may become the agent of a property owner or manager experiencing threats caused by beaver, with certification required to use suitcase type traps, including PAC agents. Trapping, other than by landowners, their immediate family members or employees, and/or the use of restricted traps requires a permit.

Property owners, managers, or their agents may take beaver with restricted body-gripping traps (*i.e.*, conibear traps) and/or out of season under authority of a 10-day emergency permit issued by the local BOH in the municipality where the trapping is to occur. If 10 days is insufficient to alleviate the beaver damage, a 30-day permit can be obtained from the MDFW. In addition, the MDFW would provide the property owner with a long-term plan to address beaver problems using non-lethal methods. While awaiting issuance of the 30-day permit, up to two additional 10-day permits may be obtained from the local BOH. With the first 10-day additional emergency permit, a property owner or their agent may continue using all three solutions available under the initial 10-day permit to address a beaver problem. With the second 10-day additional emergency permit, options to resolve the conflict are:

1. The use of box or cage-type traps only for the taking of beaver in accordance with regulations set by the MDFW
2. The breaching of dams, dikes, bogs or berms, in accordance with the local Conservation Commission's specifications and authorization.
3. Employing any non-lethal management or water-flow devices, in accordance with the local Conservation Commission's specifications and authorization.

If a 10-day emergency permit is denied by a local BOH, the decision can be appealed to the MDFW if the reason for denial is that the local BOH does not believe beaver are the species causing damage or to the MDPH if the BOH does not agree that there is a threat occurring to human health and safety (MDFW 2010).

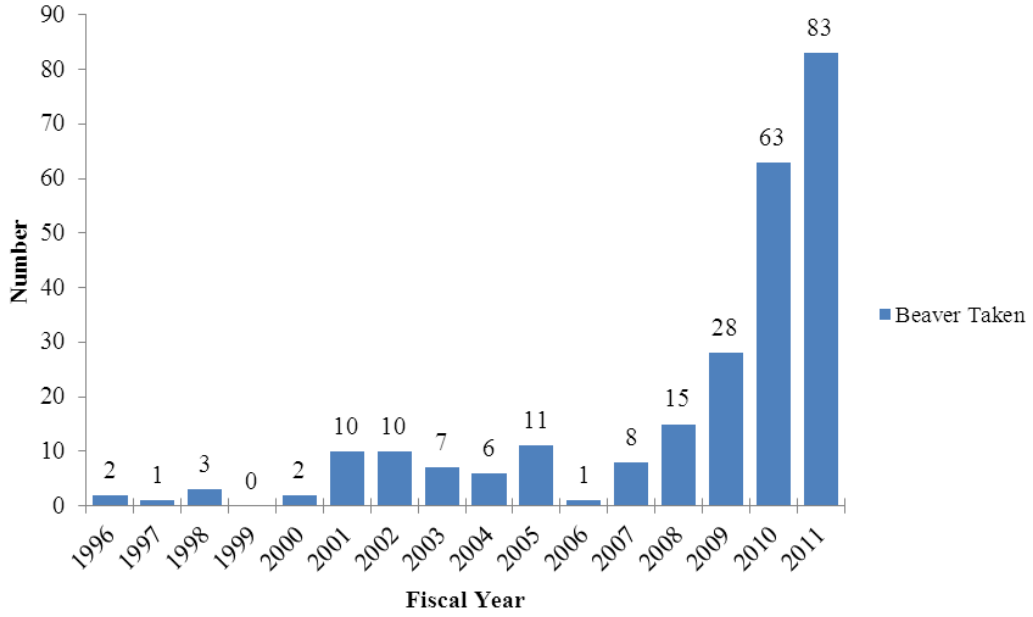
Authority to issue beaver depredation permits is also provided to the Federal Department of Public

Health, defined in 321 CMR 2.08 as the United States Public Health Service. However, the United States Public Health Service does not have the staff, training, or experience required to issue such permits and does not intend to assume this duty (Cmdr M. Lackey, U.S. Public Health Service pers. comm. 2010).

There are six repellents registered for use in deterring beaver from causing damage in Massachusetts. These are Ro-pel Animal and Rodent Repellent and Ropel Animal, Rodent and Bird Repellent with active ingredients Thymol and Denatonium saccharide; JT Eaton 4 the Birds Transparent Bird Repellent Liquid and Bird-B-Gone Transparent Bird Repellent Liquid with active ingredient Polybutene; and Shake-Away Coyote Urine Granules and Coyote/Fox Urine Granules with active ingredients of coyote urine and fox urine.

A total of 250 beaver were lethally taken by WS in Massachusetts from FY 1996 to FY 2011 to manage damage and threats to human safety (see Figure 4.3). During this period, WS also dispersed 18 beaver using non-lethal methods as part of an integrated approach to resolving large rodent damage in the Commonwealth. Beaver were dispersed through human presence, vehicles, and harassment shooting.

Figure 4.3 - Number of Beaver Taken by WS in Massachusetts by Fiscal Year, 1996 - 2011.



Primarily due to an increase in requests for assistance from municipalities in FY 2010 and FY 2011, a total of 63 and 83 beaver were lethally taken by WS in Massachusetts, respectively. Based on the number of beaver lethally taken from FY 2007 through FY 2011 and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 500 beaver annually and remove or install flow control devices in 100 beaver dams in Massachusetts as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with beaver at airports, on federal, Commonwealth, municipal and private property, landfills, along road and railways, and to protect T&E species from beaver flooding, tree felling, and habitat manipulation. To ensure the cumulative take of beaver is evaluated in this EA, the lethal take of up to 500 beaver and the removal and/or installation of flow control devices in up to 100 dams analyzed in this EA would include those beaver and dams that could be taken at airports which were analyzed in a separate EA (USDA 2002).

WS may employ dam removal or installation of flow control devices as methods to address damage by beaver flooding and human health threats related to waterborne contaminants such as Giardia and increased numbers of mosquitoes and other biting insects which act as vectors for diseases such as Eastern equine encephalitis and West Nile Virus.

From the 1995 through the 2009 trapping seasons, a total of 9,383 beaver have been taken or salvaged in the Commonwealth. Numbers for 2010 and 2011 are currently unavailable. The number of beaver taken annually in Massachusetts during annual harvest seasons has ranged from 98 beaver taken during the 1997 season to 1,172 beaver during 2001 season with an average annual take of 626 beaver. From 2000 to 2010, the total number of beaver taken pursuant to depredation permits in the Commonwealth has ranged from a low of 17 beaver in 2000, the year the emergency permitting process was instituted, to a high of 649 in 2006 with an average annual depredation take of 322 beavers. If harvest during the trapping season for beaver is combined with the number of beaver taken under depredation permits from 1999 through 2009, the combined take would range from 669 beaver to a high of 1,455 beaver with a total of 10,962 beaver taken within the Commonwealth which is an average of 996 beaver taken annually.

It should be noted these figures are not exact. Some beaver taken under emergency depredation permits by PAC agents during the legal season were sealed so the pelts could be sold and were essentially double counted. Beaver taken by non-PAC agents under emergency depredation permits outside the regulated season and discarded would only be counted if reported in a trapper survey. There is no requirement to report beaver taken under an emergency depredation permit unless the pelt is tagged.

No recent or exact population estimates are available in Massachusetts for beaver; however, the beaver population within the Commonwealth is likely increasing (L. Hajduk, MDFW pers. comm. 2009). Thus, based on the best available information for the Commonwealth's beaver population, WS' annual removal of up to 500 beaver would reduce the 2001 estimated population of 70,000 beaver by slightly more than 0.7% annually. Since population trends continue to indicate an increasing beaver population, the population of beaver in Massachusetts is likely greater than 70,000 beaver since the population was estimated almost a decade ago. An allowable harvest level for beaver has been estimated at 30% of the population (Novak 1987). The total known take of beaver in the Commonwealth has not exceeded 30% of the estimated statewide population of beaver in Massachusetts.

Based on the best available information described above, WS' potential impacts to populations of beaver has been and is expected to continue to be insignificant to the overall viability and reproductive success of beaver populations on a local or statewide scale. This determination is based on the increasing statewide trends of beaver populations as derived from MDFW data and the low magnitude of take proposed by WS when compared to the statewide population estimate.

The proposed take of up to 500 beaver annually by WS when combined with the average take of beaver in Massachusetts by entities other that WS, is below the take level expected to stabilize or cause a decline in the population. Even if the proposed take of up to 500 beaver is combined with the highest level of harvest and depredation take of beaver in Massachusetts since 1996, the overall take would be less than 2.8%, below the level where a population stabilization or decline would occur. WS' take and all known take in Massachusetts since 1996 have not reached a level that indicates an adverse impact to beaver populations is occurring. The MDFW, as the agency with beaver management responsibility could impose restrictions on depredation and harvest as needed to assure cumulative take does not adversely affect the continued viability of populations if warranted based on population data. This should assure that cumulative impacts on beaver populations would have no significant adverse impact on the quality of the human environment.

WS may breach or remove beaver dams or install flow control devices during beaver damage management activities. WS will only utilize manual methods, hands and hand tools, to breach or remove dams. WS may utilize or request cooperators use heavy equipment, such as backhoes or trackhoes, to in certain situations to remove dams or assist in installing flow control devices. Manual removal of dams requires access to the most disturbed sites in beaver habitat. Almost all activity related to manual removal of such dams occurs with 10 feet of the center of the dam. This area is always dredged, dug, and littered by the beaver's dam building activity and it is unlikely that freshwater mussels and significant numbers of other aquatic animals or plants would be found in close proximity to this area. Material removed from those dams is either tossed on the bank of the water body or stream, or escapes to flow downstream. Mud and small materials such as bark and other plant debris also escapes downstream and tends to settle out within 40 to 60 feet. Small to medium limbs may drift further distances. Few large limbs are used in such dams and those that are usually remain at the dam site.

Dam breaching, removal or installation of flow control devices are usually conducted in conjunction with local population reductions using trapping and/or shooting. As a result, changes in habitat generally have not long term effects on local beaver populations. Some animals that escape removal may lose or have limited access to stored food caches during winter months due to lower water levels and the presence of ice. This may limit winter survival of some individuals due to starvation or increased predation risk while feeding on land. However, reductions in local populations would result in lower interspecific competition for available food resources. Dam removal or flow manipulation will have no effect on neighboring populations and will not alter habitat in a way that does not allow for future use by beaver or recolonization.

Muskrat Population Impact Analysis

Muskrats are fairly large rodents with dense, glossy fur, dark brown above, lighter on the sides, paler below, to nearly white on the throat. They have long scaly tails which are nearly naked and laterally flattened, tapering to a point but not paddle-shaped as the beaver. The muskrat spends its life in aquatic habitats and is well adapted for swimming. Its large hind feet are partially webbed, stiff hairs align the toes and its laterally flattened tail is almost as long as its body. The muskrat has a stocky appearance, with small eyes and very short, rounded ears. Its front feet, which are much smaller than its hind feet, are adapted primarily for digging and feeding (Miller 1994).

They build houses, or lodges of aquatic plants, especially cattails, up to 2.4 m (8 feet) in diameter and 1.5 m (5 feet) high. Those structures are usually built atop piles of roots, mud, or similar support in marshy areas, streams, lakes, or along water banks. Muskrats also burrow in stream or pond banks with entrances often above the water line. Other signs of the presence of muskrats include: feeding platforms built of cut vegetation in water or on ice, marked by discarded or uneaten grasses or reed cuttings, and floating blades of cattails, sedges, and similar vegetation near banks. This species is most active during crepuscular periods and at night, but may be seen at any time of the day in all seasons, especially spring. Muskrats are excellent swimmers and spend much of their time in the water. They inhabit fresh, salt, and brackish waters of marshes, ponds, lakes, rivers, and canals in most of Canada and the United States, except for Arctic regions, much of California, the southwestern United States, Texas, and Florida (National Audubon Society 2000). They can be found in marshes, ponds, sloughs, lakes, ditches, streams, and rivers (Boutin and Birkenholz 1987).

Muskrats are highly prolific and produce three to four litters per year that average five to eight young per litter (Wade and Ramsey 1986), which makes them relatively immune to overharvest (Boutin and Birkenholz 1987). Gestation period varies between 25 and 30 days. Young muskrats can reproduce the spring after their birth. Harvest rates from three to eight per acre have been reported to be sustainable in muskrat populations (Boutin and Birkenholz 1987). Muskrat home ranges vary from 529 ft^2 to 11,970 ft^2

(0.1 to 0.25 acres), with the size of muskrat home ranges depending on habitat quality and population density (Boutin and Birkenholz 1987).

The muskrat is found across the Commonwealth in Massachusetts except Nantucket County (MDFW 2009). Because muskrat pelts do not require sealing, and there is no requirement to report the number of muskrats trapped during the regulated season, it is unknown how muskrat populations were affected in Massachusetts after implementation of a ban on the use of foothold traps and restrictions on conibear trapping. It can be assumed that the population increased; however, the populations of muskrat predators, particularly mink, may also be assumed to have increased.

Young muskrats are especially vulnerable to predation. Adult muskrats may also be subject to predation, but rarely in numbers that would significantly alter populations. Predation cannot be depended upon to solve damage problems caused by muskrats (Miller 1994). Predators of muskrat include great horned and barred owls, red-tailed hawks, bald eagles, raccoons (*Procyon lotor*), mink, river otter, red fox, gray fox (*Urocyon cineroagenteus*), coyotes, bobcat, Northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), snapping turtles (*Chelydra serpentine*), and bullfrogs (*Rana catesbeiana*). The young are also occasionally killed by adult muskrats (Miller 1994).

Muskrats are hosts to large numbers of endoparasites and ectoparasites, and serve as carriers for a number of diseases, including tularemia, hemorrhagic diseases, leptospirosis, ringworm disease, and pseudotuberculosis. Most common ectoparasites are mites and ticks. Endoparasites are predominantly trematodes, nematodes, and cestodes.

Muskrats are managed as furbearers by the MDFW with an annual trapping season which allows an unlimited number of muskrats to be harvested during the open season. Take can occur by licensed trappers during the regulated season using approved cage-type traps. Suitcase-type traps such as Bailey traps and Hancock traps are not authorized for use in trapping muskrats and colony traps are also prohibited. Landowners or tenants, their immediate family members or employees may take muskrat on their property that are causing or threatening to cause damage year round using lawful methods such as box trapping or firearms. Property owners, managers or their agents may take muskrat out of season and/or with conibear-style body-gripping traps under authority of a 10-day emergency permit issued by the local BOH in the municipality where the trapping is to occur. However, unlike beaver, muskrat are covered under PAC regulations and may be taken by licensed PAC agents year round. There is one toxicant registered for use in managing muskrats in Massachusetts, Zinc Phosphide for Rodent and Lagomorph Control, EPA registration number 56228-6, a restricted use pesticide.

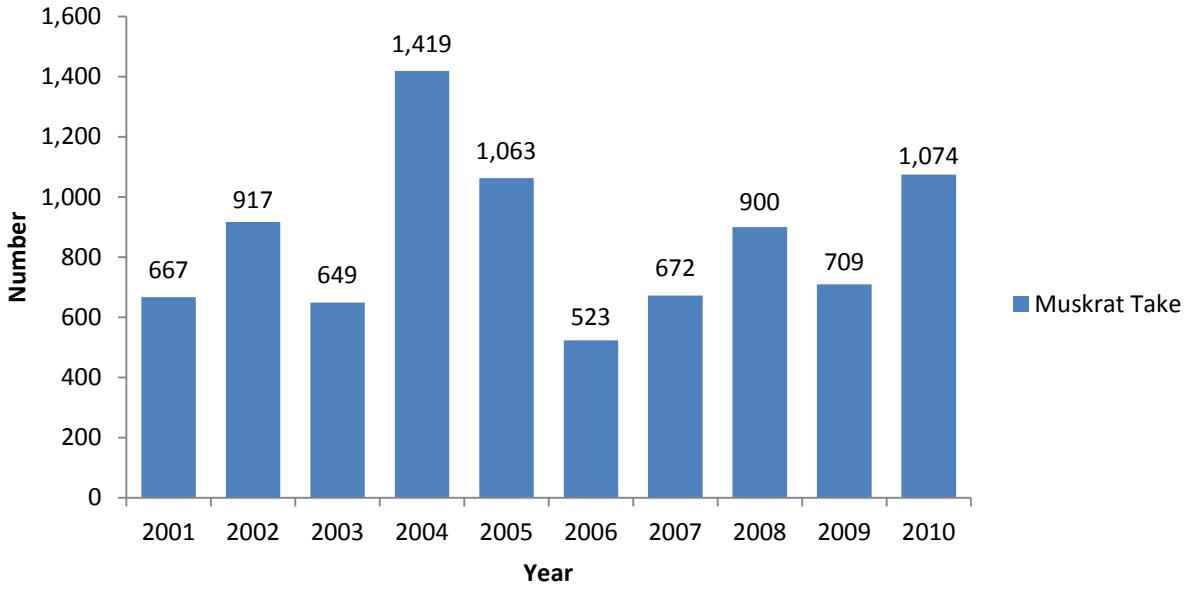
From the 2000 through the 2009 trapping seasons, corresponding to FY 2001 to FY 2010, the number of muskrats estimated through trapper surveys as taken annually in Massachusetts through annual harvest by recreational trappers has ranged from 523 during the 2005 trapping season to 1,419 during the 2003 season with a 10-year average annual take of 860 muskrats (see Figure 4.4). This data does not include any take from PAC agents.

A total of 94 muskrats have been lethally taken by WS in Massachusetts from FY 1996 to FY 2011 to manage damage and threats to human safety as seen in Figure 4.5. The highest level of take occurred in FY 2001 when 53 muskrats were lethally taken in the Commonwealth to alleviate damage or threats of damage. WS did not non-lethally disperse any muskrats during this period.

In FY 2010, a total of 21 muskrats were lethally taken by WS in Massachusetts to alleviate burrowing damage to levees of a reclaimed wetland at a Superfund Site. Based on the number of muskrats lethally taken from FY 1996 through FY 2011, the relatively low level of legal harvest and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 500

muskrats per year as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with muskrats on federal, Commonwealth, municipal and private property, landfills, along road and railways and to protect T&E species from predation and habitat manipulation. To ensure the cumulative take of muskrats is evaluated in this EA, the lethal take of up to 500 muskrats analyzed in this assessment would include those muskrats that could be taken at airports which were analyzed in a separate EA (USDA 2002).

Figure 4.4 – Harvest of muskrats in Massachusetts during the trapping season, FY 2001 to 2010



No population estimates are available in Massachusetts for muskrat. Based on the best available information and MDFW estimates, the Commonwealth's muskrat population is stable or increasing (L. Hajduk, MDFW pers. comm. 2011). WS' annual removal of up to 500 muskrats would increase the 10-year average annual muskrat harvest and depredation take in Massachusetts by slightly more that 58%.

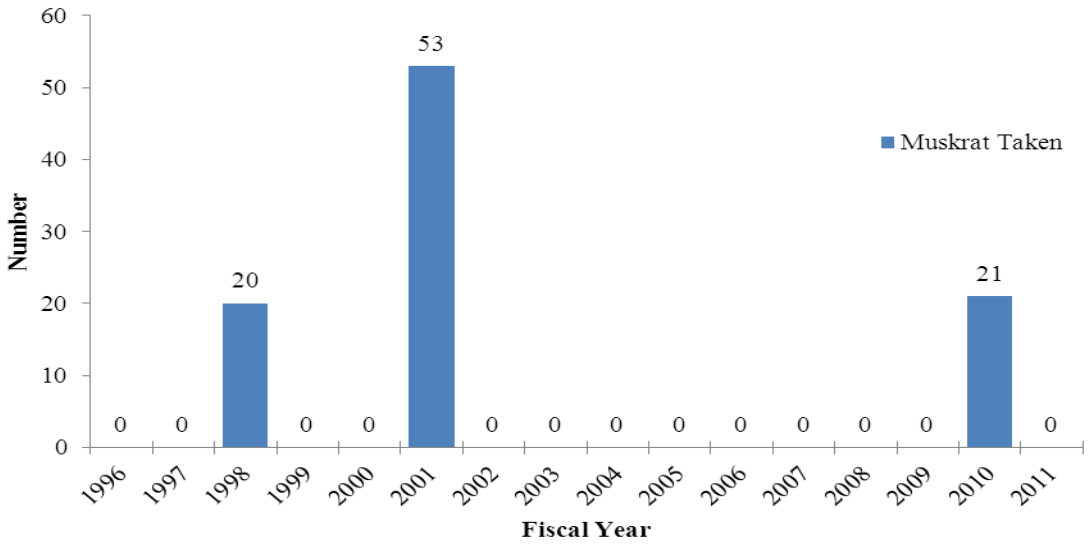
Based on the best available information described above, WS' potential impacts to populations of muskrats has been and is expected to continue to be insignificant to the overall viability and reproductive success of muskrat populations on a local or statewide scale. This determination is based on the stable to increasing statewide trends of muskrat populations.

The proposed take of up to 500 muskrats annually by WS when combined with the average take of muskrats in the Massachusetts by entities other that WS, is below the take level expected to cause a decline in the population. Compared to annual sustained harvest levels in other states of similar size, wetland composition and population density where trap type availability is wider, Massachusetts muskrat harvests are low. As part of WS' annual reporting of programmatic activities, information regarding the harvest levels of those species addressed by WS throughout the United States was gathered and reported along with the number of each wildlife species addressed by WS during a particular year. As part of the Program Data Reports published by WS from FY 2000 to FY 2004, information on the harvest levels, population estimates, and population trends of several wildlife species were solicited from state and federal wildlife agencies[9]. As part of those Program Data Reports published by WS from FY 2000 to FY

[9]At the time this EA was developed, the Program Data Reports published by WS could be found at http://www.aphis.usda.gov/wildlife_damage/index.shtml and clicking on the "Program Data Reports" link. The information regarding wildlife harvest levels in Massachusetts, Connecticut, and Rhode Island provided by the respective state wildlife agencies could be found in Table 11 of the data reports from FY 2000 through FY 2004.

2004, information on the harvest levels of muskrats in Massachusetts were provided to WS from the MDFW. Annual harvest estimates and the average estimated annual harvest of muskrats in Massachusetts, Connecticut, and Rhode Island from 2000 through 2004 are shown in Table 4.1 based on information provided to WS by the respective state wildlife agencies, including the MDFW. This five-year period was analyzed because harvest data for all three states is published and readily available. Since FY 2005, publishing information on the population and harvest information has been discontinued. Massachusetts, Connecticut, and Rhode Island border each other; have similar geography, weather, human population densities, and percentages of surface water to total area.

Figure 4.5 - Number of Muskrats Taken by WS in Massachusetts by Fiscal Year, 1996 - 2011.



When reviewing the differences in average annual muskrat harvest between the three Southern New England States, the analyses must first consider the available methods allowed for harvest. In Massachusetts, box/cage type traps are the only available trap allowed strictly for fur/sport trapping; however, conibear type traps may be used to take muskrat only with a special permit issued by a local BOH in situations that meet human health and safety threat criteria. Rhode Island allows for both box/cage traps and conibear traps for fur/sport trapping of muskrats (Rhode Island Department of Environmental Management 2010). Connecticut allows box/cage traps, conibear traps, and both padded and un-padded foothold traps (Connecticut Department of Environmental Protection 2010).

Table 4.1 – Massachusetts, Connecticut and Rhode Island Estimated Annual Harvest of Muskrats, 2001 – 2005

	Harvest Season					
State	**2001**	**2002**	**2003**	**2004**	**2005**	**5-yr Average**
Massachusetts	747	667	917	649	1,419	**880**
Connecticut	1,568	2,443	3,022	1,347	2,249	**2,126**
Rhode Island	512	245	264	216	177	**283**

The types of trapping methods available may affect trapping activity by influencing the cost of trapping, the number of traps a trapper can set during the time available, the success of individual trap sets, and possibly even the enjoyment of sport trapping. This can be due to a variety of factors based on the size, use and effectiveness of different trap types. Evidence of this may be seen in Figure 4.1 when a significant reduction in harvest of beaver occurred after

implementation of the trap ban in Massachusetts. Figure 4.1 and Figure 4.4 also show evidence of an increase in beaver and muskrat harvest in 2001 after authority for permitting of conibear traps was transferred to municipalities. However, it should be noted that muskrat harvest numbers are only estimates created by using voluntary trapper surveys.

Conibear and foothold traps are smaller, less expensive and easier to transport than box traps allowing a trapper to set more traps in a trap line in a shorter time period at less cost. Box traps require bait that must be transported with traps, while conibear and foothold traps do not require bait. Purchasing or collecting appropriate bait can add additional costs or time to trapping reducing trapping effort.

According to Bluet (2001), trappers who use systems designed to kill animals soon after their capture report fewer incidents of injury, escape, theft, predation, and pelt damage than when using systems designed to hold animals alive until traps are checked the next day. This is most likely because they are smaller and less obvious than box traps, usually set in more inconspicuous locations, and usually hold the captured animal underwater.

When trapping muskrats, conibear traps must be, and foothold traps may be set underwater in runways and other areas more likely to be frequented by muskrats. As a result, they are generally more effective at capturing muskrats than box traps which must be set at or above the waterline and due to size are limited in where they can be set. Conibear traps and foothold traps using drowning sets kill quickly through cervical dislocation or asphyxiation/drowning allowing for easier collection of harvested muskrats and quicker resetting of traps than box traps or foothold traps without drowning sets that require trapped animals to be euthanized. Some trappers may even consider box traps that may hold an animal for hours, often in inclement weather, while awaiting euthanization which could be perceived as less humane than traps that kill quickly, resulting in reduced desire to engage in sport trapping.

Table 4.2 provides the ranking and a comparison of the total area of the three Southern New England states in square miles to the estimated average annual muskrat harvest per square mile from 2000 to 2004. Total area of Massachusetts is 10,555 mi^2, Connecticut is 5,543 mi^2, and Rhode Island is 1,545 mi^2 (U.S. Census Bureau 2004), which ranks 44th, 48th, and 50th in total area, respectively, among the 50 States.

Table 4.2 – Massachusetts, Connecticut, and Rhode Island Average Annual Estimated Muskrat Harvest per Mile^2 from 2000 to 2004

State	Total Area (mi^2)	National Rank	Muskrat Harvest Density (mi^2)†
Massachusetts	10,555	44th	0.08
Connecticut	5,543	48th	0.38
Rhode Island	1,545	50th	0.18

†Muskrats harvested per mi^2 of the total area

As shown in Table 4.3, Massachusetts has 2,715 mi^2 of surface water, comprising of 25.72% of the total area. Connecticut has 699 mi^2 of surface water comprising 12.61% of total area while Rhode Island has 500 mi^2 of surface water comprising 32.36% of total area. Massachusetts, Connecticut and Rhode Island are ranked 4th, 14th and 3rd for percentage of surface water to total area. Being an aquatic mammal, surface water area is more indicative of muskrat habitat than total area.

Table 4.3 – Massachusetts, Connecticut, and Rhode Island Average Annual Estimated Muskrat Harvest per Mile^2 of Surface Water from 2000 to 2004

State	Total Water Area (mi^2)	% Water Area to Total Area	National Rank by % Water Area to Total Area	Muskrat Harvest Densities (mi^2)†
Massachusetts	2,715	25.72%	4th	0.32
Connecticut	699	12.61%	14th	3.04

Rhode Island	500	32.36%	3rd	0.57

†Muskrats harvested per mi^2 of the total water area

During the five-year period from 2000 to 2004, the average annual muskrat harvest in Massachusetts was 880 while Connecticut averaged 2,126 and Rhode Island averaged 283. Massachusetts averaged 241.6% fewer muskrats than Connecticut. This is despite being 90.4% larger in total area and having 289.3% more surface water than Connecticut. Although, the Massachusetts harvest was 311.1% higher than the Rhode Island harvest, Massachusetts is 583.2% larger in total area and has 443.4% more surface water. Muskrat harvest in Massachusetts is not necessarily spread evenly throughout the state. In 2009, muskrats were reportedly trapped in only 15 towns and in 2010; muskrat were reportedly trapped in 20 towns out of 351 cities and towns in the Commonwealth.

When comparing average annual muskrat harvest per mi^2 of total area in each state, the analyses show that the Massachusetts rate was 0.08 muskrats per mi^2 while the rate in Rhode Island was 0.18 muskrats per mi^2 and Connecticut was 0.38 muskrats per mi^2. The difference in average annual harvest per mi^2 of surface water, which is more indicative of potential muskrat habitat, is even greater. The harvest of muskrats in Massachusetts per mi^2 of surface water was 0.32 muskrats, Rhode Island was 0.57 muskrats, and Connecticut was 3.05 muskrats. Rhode Island harvested 74.7% more muskrats per mi^2 of surface water, while Connecticut harvested 840.5% more.

Table 4.4 shows the estimated population and national ranking of the three Southern New England states in 2005 and 2009 as well as population per mi^2 and estimated average annual harvest of muskrats per 10,000 residents. Trapping pressure, measured as the number of individual muskrats trapped per 10,000 residents, also mirrored harvest rates by area and surface water area in each state during this period. Rhode Island, Massachusetts, and Connecticut were the 2nd, 3rd and 4th most densely populated states, respectively, during both the 2000 and 2010 Census (U.S. Census Bureau 2010). Based on population estimates published by the United States Census Bureau on July 1, 2005, the average annual harvest for the five-year period from FY 2001 to FY 2005 per 10,000 residents was 1.4 muskrats in Massachusetts, 2.7 in Rhode Island, and 6.1 in Connecticut. Rhode Island had 94.8% more muskrats trapped per 10,000 residents than Massachusetts and Connecticut had 348.4% more muskrats trapped per 10,000 residents. Although 2010 population data was available, 2005 population figures were used because the period being analyzed was FY 2001 to FY 2005.

Table 4.4 – Massachusetts, Connecticut and Rhode Island Average Annual Estimated Muskrat Harvest per 10,000 people based on U.S. Census Bureau Population Estimates Issued July 1, 2005 during a 5 Year Period from 2000 to 2004

	2009 Population Density Persons per $Mile^2$	National Rank	Population as of July 1, 2005	Population as of 2010 Census	Muskrats Harvested per 10,000 Population on July 1, 2005
MA	839.4	3rd	6,453,031	6,547,629	1.4
CT	738.1	4th	3,477,416	3,574,097	6.1
RI	1018.1	2nd	1,064,989	1,052,567	2.7

Given the sustained harvest rates for muskrat in Connecticut and Rhode Island, it is reasonable to assume that given the larger total area and surface water area, Massachusetts could easily sustain a much higher muskrat harvest rate. If Rhode Island harvest rates per mi^2 are applied to the total area and surface water area and trapping pressure per 10,000 residents are applied to Massachusetts, we would expect to see annual muskrat harvests of 1,537 based on total area, 1,932 based on surface water area, and 1,751 based on harvest per 10,000 residents, respectively. Applying Connecticut rates would give harvests of 8,275,

4,047, and 4,031, respectively. Using figures derived from sustained harvest in Rhode Island, WS' take of 500 muskrats in addition to the 10-year average annual harvest of 860 muskrat in Massachusetts from FY 2001 to FY 2010 (see Figure 4.4) would not reach a level that would impact muskrat populations in Massachusetts. Even if the highest harvest during the 10-year period of 1,419 muskrats taken during the 2004 trapping season is combined with WS' take of 500, total take would not reach the level based on the Rhode Island harvest rate for surface water area. If Connecticut harvest rates were used, WS' analyzed take of 500 and the highest 10-year Massachusetts harvest would be less than half of what could reasonably be expected to be sustainable.

If necessary, the MDFW, as the agency with muskrat management responsibility could impose restrictions on depredation and harvest as needed to assure cumulative take does not adversely affect the continued viability of populations if warranted based on population data. This should assure that cumulative impacts on muskrat populations would have no significant adverse impact on the quality of the human environment.

Woodchuck Population Impact Analysis

The woodchuck, a member of the squirrel family, is also known as the "*ground hog*" or "*whistle pig*." It is closely related to other species of North American marmots. It is usually grizzled brownish gray, but white (albino) and black (melanistic) individuals can occasionally be found. The woodchuck's compact, chunky body is supported by short strong legs. Its forefeet have long, curved claws that are well adapted for digging burrows. Its tail is short, well furred, and dark brown. They dig large burrows, generally 8 to 12 inches at the opening, sometimes 5 feet deep and 30 feet long with more than one entrance to a spacious grass-filled chamber. Green vegetation such as grasses, clover, and alfalfa forms its diet; at times it will feed heavily on corn and can cause extensive damage in a garden to other crops (National Audubon Society 2000). Woodchucks may also jeopardize the integrity of earthen dams, present hazards to livestock and farm equipment as a result of burrowing; gnaw electrical cables, and damage hoses and other accessories on automobiles by gnawing (Bollengier 1994).

The breeding season for groundhogs is usually from March through April (Bollengier 1994). Female woodchucks usually produce from four to six young (Chapman and Feldhamer 1982). The offspring breed at age one and live four to five years. Mammal species with high mortality rates, such as rodents (*i.e.*, woodchucks) and lagomorphs (*i.e.*, rabbits), typically possess high reproductive rates and produce large and frequent litters of young (Smith 1996). For example, if a pair of groundhogs and their offspring all survived to breed as soon as possible, with an average litter size of four with a 1:1 sex ratio; they could produce over 645 groundhogs through their life time. The range of the woodchuck in the United States extends throughout the East, northern Idaho, northeastern North Dakota, southeastern Nebraska, eastern Kansas, northeastern Oklahoma, and south to Virginia and Alabama.

Both sexes are similar in appearance, but the male is slightly larger, weighing an average of five to 10 pounds (2.2 to 4.5 kg). The total length of the head and body averages 16 to 20 inches (40 to 51 cm). The tail is usually four to seven inches (10 to 18 cm) long. Like other rodents, woodchucks have white or yellowish-white, chisel-like incisor teeth. Their eyes, ears, and nose are located toward the top of the head, which allows them to remain concealed in their burrows while they check for danger over the rim or edge. Although they are slow runners, woodchucks are alert and scurry quickly to their dens when they sense danger (Bollengier 1994). They are found everywhere in Massachusetts except Dukes County (Martha's Vineyard) and Nantucket County (MDFW 2009).

Woodchucks are managed as a game species by the MDFW and a valid hunting license is required to hunt woodchucks during a 50-week season with no limit on the number that can be harvested. No woodchuck hunting is allowed during the two week shotgun season for white-tailed deer. Like most species in

Massachusetts they can be shot or trapped by a property owner or tenant, their immediate family member or full time employee when causing damage and they are considered a PAC species. There are no reporting requirements for licensed hunters or trappers taking woodchucks. PAC agents are required to report the number of woodchucks taken annually. PAC agents reported the take of 383 woodchucks in 2007, 180 woodchucks during 2008, and 356 woodchucks in 2009 to alleviate damage (M. Huguenin, MDFW, pers. comm. 2010).

There are 15 products registered for use in managing woodchucks in Massachusetts, 7 toxicants, 3 gas cartridges and 5 repellents. The toxicants are Degesch Phostoxin Tablets-R and Pellets; Detia Phos Pellets and Tablets; and Gastoxin Fumigation Pellets and Tablets with the active ingredient of Aluminum Phosphide and Zinc Phosphide Concentrate for Rodent and Lagomorph Control. The gas cartridges are Gas Cartridges for Burrowing Rodents with active ingredients Carbon and Sodium Nitrate, Revenge Rodent Smoke Bomb with active ingredients Carbon, Potassium Nitrate, and Sulfur and The Giant Destroyer with active ingredients Carbon, Sodium Nitrate, and Sulfur. The repellents are Shake-Away Coyote Urine Granules, Coyote/Fox Urine Granules, and Fox Urine Granules with active ingredients of coyote and/or fox urine and Havahart Critter Ridder Concentrate and RTU (ready to use) with active ingredients black pepper oil, piperidine and capsaicin.

A total of 328 woodchucks were lethally taken by WS in Massachusetts from FY 1996 to FY 2011 to manage damage and threats to human safety as seen in Figure 4.6. WS non-lethally dispersed six woodchucks during this period.

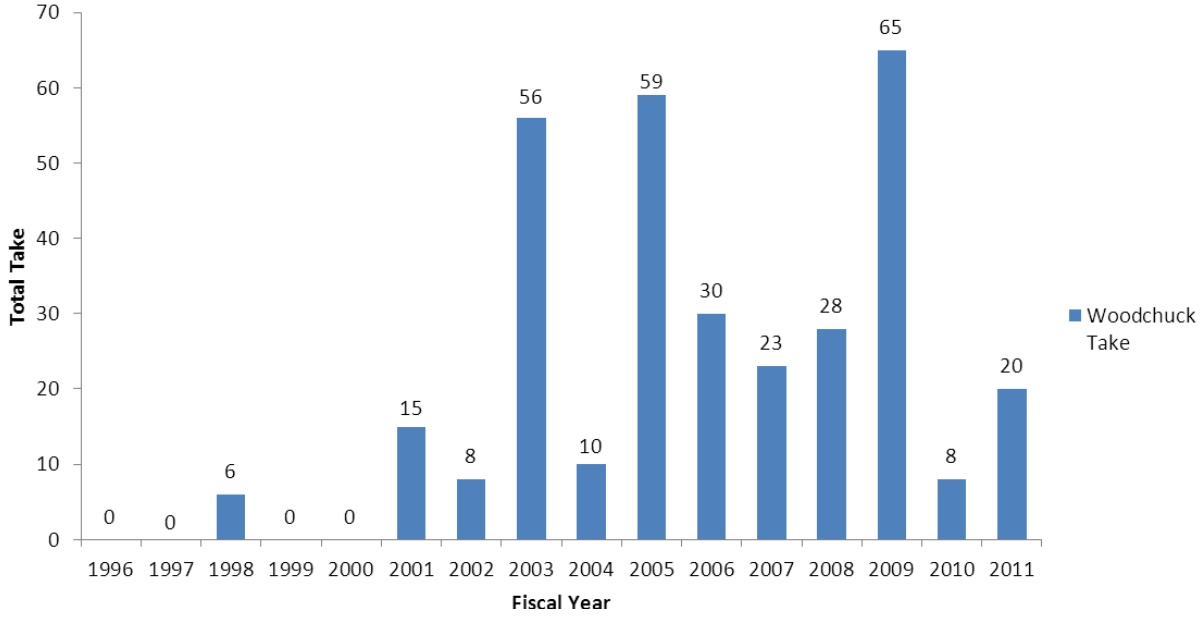
There are no current estimates of the Massachusetts population; however, based on the best available information and MDFW estimates, the Commonwealth's woodchuck population is stable (L. Hajduk, MDFW pers. comm. 2011). Most woodchucks taken by WS from FY 1996 to FY 2010 were at airports. Based on the number of woodchucks lethally taken by WS from FY 1996 through FY 2010, the general abundance of the species and lack of legal harvest limits and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 500 woodchucks annually as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with woodchucks at airports, on federal, state, municipal and private property, landfills, along roads, railways, dikes and dams and to protect threatened and endangered plant species from predation. To ensure the cumulative take of woodchucks is evaluated in this EA, the lethal take of up to 500 woodchucks analyzed in this assessment will include those woodchucks that could be taken at airports which were analyzed in a separate EA (USDA 2002).

Gas cartridges could be employed to fumigate woodchuck burrows in areas where damages are occurring. Gas cartridges act as a fumigant by producing carbon monoxide when ignited. The cartridges contain sodium nitrate which when burnt, produces carbon monoxide gas. The cartridges are placed inside active burrows at the entrance, the cartridge is ignited, and the entrance to the burrow is sealed with dirt which allows the burrow to fill with carbon monoxide. Carbon monoxide is a method of euthanasia considered conditionally acceptable by the American Veterinary Medical Association (AVMA) for free-ranging mammal species (AVMA 2007).

The number of entrances to burrow systems used by woodchucks varies. Twichell (1939) found the number of entrances to burrow systems used by woodchucks ranged from two to six entrances in Missouri with the average number being 2.8 entrances. Other studies note the number of entrances per burrow system ranged from one to five entrances (Grizzell, Jr. 1955) to high of 11 entrances per system (Merriam 1971). Merriam (1971) found the mean number of entrances per burrow system was 2.98 entrances. The use of burrow systems is usually restricted to a male and a reproductive female (Swihart 1992, Armitage 2003). The number of woodchucks lethally removed when using

gas cartridges to fumigate burrows would be based on the mean number of entrances per burrow system of approximately three entrances (Twichell 1939, Merriam 1971) and each burrow system occupied by a male and a female (Swihart 1992, Armitage 2003). The take of woodchucks would also occur using other methods, such as shooting, live traps, and body-gripping traps. However, the number of woodchucks lethally taken using gas cartridges and by other methods is not expected to exceed 500 woodchucks.

Table 4.6 – WS' Take of Woodchucks in Massachusetts from FY 1996 to FY 2011



If necessary, the MDFW, as the agency with woodchuck management responsibility could impose restrictions on harvest and depredation as needed to assure cumulative take does not adversely affect the continued viability of populations if warranted based on population data. This should assure that cumulative impacts on woodchuck populations would have no significant adverse impact on the quality of the human environment. The unlimited harvest level allowed by the MDFW also provides an indication that populations of woodchucks are not likely to be harvested.

Porcupine Population Impact Analysis

North American porcupines are heavy-bodied, short-legged, slow rodents with a waddling gait. In Massachusetts, they are typically arboreal, spending most of their time in trees. Adults are typically 25 to 30 inches (64 to 76 cm) long and weigh 10 to 30 pounds (4.5 to 13.5 kg). They rely on their sharp, barbed quills (up to 30,000 per individual) for defense. They are found in Northeastern, Central and Western Massachusetts with recent reports in Plymouth and Barnstable Counties in the Southeast. They are not present in Dukes and Nantucket Counties (MDFW 2009).

Porcupines, like woodchucks, are managed as a game species by the MDFW and a valid hunting license is required to hunt them during a 50-week season with no limit on the number that can be harvested. No porcupine hunting is allowed during the two week shotgun season for white-tailed deer. Porcupines can be shot or trapped by a property owner or tenant, their immediate family member or full time employee when causing damage and they are considered a PAC species. There are no reporting requirements for licensed hunters or trappers taking porcupines. PAC agents are required to report the number of porcupines taken annually.

A total of six porcupines have been reported as taken by PAC agents in the State from 2007 through 2009, with five taken in 2008 and one porcupine taken in 2009 (M. Huguenin, MDFW, pers. comm. 2010). There are no current estimates of the Massachusetts porcupine population, although the population is believed to be stable (L. Hajduk, MDFW pers. comm. 2011).

There are three repellents registered for use in deterring porcupine damage in Massachusetts. These are Hot Sauce Animal Repellent with the active ingredient Capsaicin, in oleoresin of capsicum, and Shake-Away Coyote/Fox Urine Granules, and Fox Urine Granules with active ingredients of coyote and fox urine and fox urine respectively.

One porcupine was live captured by WS in FY 2005 and translocated to a forested area on site. Only one porcupine was lethally taken by WS in Massachusetts from FY 1996 to FY 2011, which occurred at an airport in FY 2011.

Based on the number of porcupines lethally taken by PAC agents, the lack of lethal control by WS, the general abundance of the species and lack of legal harvest limits and a reasonable anticipation of an increase in the number of requests for assistance, WS could lethally take up to 100 porcupines as part of an integrated damage management program. WS anticipates an increase in the need to address damage and threats associated with porcupines at airports, on federal, Commonwealth, municipal and private property, including commercial orchards and timber stands and to protect T&E plant species from predation. To ensure the cumulative take of porcupines is evaluated in this EA, the lethal take of up to 100 porcupines analyzed in this assessment will include those porcupines that could be taken at airports which were analyzed in a separate EA (USDA 2002).

If WS lethally takes 100 porcupines and if the take of porcupines under annual depredation from 2007 through 2009 is indicative of future lethal take in Massachusetts, the total non-WS take and the proposed total WS take of porcupines evaluated in this assessment would not reach the level necessary to cause a decline in the Massachusetts porcupine population.

If necessary, the MDFW, as the agency with porcupine management responsibility could impose restrictions on harvest and depredation as needed to assure cumulative take does not adversely affect the continued viability of populations if warranted based on population data. This should assure that cumulative impacts on porcupine populations would have no significant adverse impact on the quality of the human environment.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

Large rodent populations in the Commonwealth would not be directly impacted by WS from a program implementing technical assistance only. However, persons experiencing damage or threats from large rodents may implement methods based on WS' recommendations. Under a technical assistance only alternative, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve large rodent damage. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. Requestors may implement WS' recommendations, implement other actions, or take no action. However, those persons requesting assistance are likely those persons that would implement damage abatement methods in the absence of WS' recommendations.

Under a technical assistance only alternative, those persons experiencing threats or damage associated with large rodents in the Commonwealth could lethally take large rodents despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of large rodents lethally taken would likely be similar to the other alternatives since take could occur through legal

harvest, land owner or tenant control, PAC agents, or the issuance of emergency depredation permits by a municipal BOH, and the MDPH for beaver and muskrat. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the MDFW, it is unlikely that large rodent populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the MDFW, private entities, and/or municipal authorities. If direct operational assistance is not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USDA 1997, USFWS 2001, FDA 2003). Effects and risks of illegal killing of large rodents under this alternative would probably be similar to Alternative 3.

Alternative 3 – No Large Rodent Damage Management Conducted by WS

Under this alternative, WS would not conduct large rodent damage management activities in the Commonwealth. WS would have no direct involvement with any aspect of addressing damage caused by large rodents and would provide no technical assistance. No take of large rodents by WS would occur in the Commonwealth. Large rodents could continue to be lethally taken to resolve damage and/or threats occurring through legal harvest, landowner or tenant control, PAC agents and depredation permits issued by a municipal BOH and the MDFW.

Local large rodent populations could decline, stay the same, or increase depending on actions taken by those persons experiencing large rodent damage. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of large rodents out of frustration or ignorance. Resource/property owners may obtain permits from the a local BOH and the MDFW that allow them to lethally take large rodents outside of the annual hunting and trapping seasons and in those areas where hunting is not allowed. Large rodent populations could continue to increase where hunting and trapping pressure were low or when an insufficient number of large rodents are removed under permits issued by the local Boards of Health and the MDFW. Some local populations of large rodents would temporarily decline or stabilize where hunting and trapping pressure and permitted removal activities were adequate. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of large rodents out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action.

Since large rodents could still be taken under this alternative, the potential effects on the populations of large rodents in the Commonwealth would be similar among all the alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct large rodent damage management activities without WS' direct involvement. Therefore, any actions to resolve damage or reduce threats associated with large rodents could occur by other entities despite WS' lack of involvement under this alternative.

Issue 2 - Effects on Non-target Species Populations, Including T&E Species

As discussed previously, a concern is often raised about the potential impacts to non-target species, including T&E species, from the use of methods to resolve damage caused by large rodents. The potential effects on the populations of non-target wildlife species, including T&E species, are analyzed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

The potential adverse effects to non-targets occur from the employment of methods to address large rodent damage. Under the proposed action, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. The use of non-lethal methods as part of an integrated direct operational assistance program would be similar to those risks to non-targets discussed in the other alternatives. Personnel from WS are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS would employ the most selective methods for the target species, would employ the use of attractants that are as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. SOPs to prevent and reduce any lethal take of non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target take during program activities, the potential for adverse impacts to non-target exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by large rodents are also likely to disperse non-targets in the immediate area the methods are employed. Therefore, non-targets may be permanently dispersed from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species from the use of non-lethal methods are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods.

Other non-lethal methods available for use under this alternative include live-traps and repellents. Live traps (*e.g.*, cage traps) restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to live-capture non-target species. Trap placement in areas where target species are active and the use of attractants as specific to the target species as possible would minimize the likelihood of capturing non-targets. Though the use of live-traps are virtually selective for target individuals and live-capture does occur from those methods, the potential for death of a target or non-target animal while being restrained or released does exists. Trap placement in areas where target species are active and the use of target-specific attractants would likely minimize the capture of non-targets. If traps are attended to appropriately, any non-targets captured can be released on site unharmed. The lethal take of non-targets from using those methods is unlikely with take never reaching a magnitude that a negative impact on populations would occur. Any potential non-targets captured using non-lethal methods would be handled in such a manner as to ensure the survivability of the animal if released. The potential adverse effects associated with non-lethal methods are negligible and, in the case of exclusion and harassment methods, often temporary.

The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of non-targets to beneficial resources. Overall, potential impacts to non-targets from the use of non-lethal methods only would not adversely impact populations since those methods are often temporary.

Only those repellents registered with the EPA pursuant to the FIFRA and registered for use in the

Commonwealth would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for large rodents are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested. Chemicals commonly registered with the EPA as repellents for large rodents are capsaicin, pepper oil, and carnivore urine.

Overall, impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed. WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. Impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by large rodents under this alternative would include shooting (beaver, muskrat, porcupine, and woodchuck), use of conibear traps set underwater (beaver and muskrat), gas cartridges (woodchucks), aluminum phosphide (woodchucks), and zinc phosphide (woodchucks and muskrats). On federal property, foothold traps with drowning sets (beaver and muskrat) and land set conibear traps (porcupines and woodchucks) could be utilized. In addition, large rodents could also be euthanized once live-captured by other methods. Euthanasia of live-captured large rodents would occur pursuant to WS Directive 2.505. Available methods and the application of those methods to resolve large rodent damage are further discussed in Appendix B.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method. Immobilizing and euthanasia drugs are applied directly to the target individual through injection only after that individual is properly restrained and immobilized. Therefore, immobilizing and euthanizing drugs would have no direct adverse impact on non-targets. Carcasses of large rodents euthanized with euthanasia drugs would be disposed of by deep burial or by incineration to prevent consumption of the carcasses by non-targets. The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method.

WS may use certain EPA-registered pesticides, including sodium nitrate based gas cartridges, zinc phosphide, and aluminum phosphide for some large rodent damage management. When using fumigants, burrows would be observed for the presence of non-targets before the use of fumigants. If non-target activity (*e.g.*, tracks, scat) is observed, the fumigation of those burrows would not occur. Since non-targets are known to occur in burrows, some risks of unintentional take of non-targets does exist from the use of fumigants. For example, burrows of woodchucks can be used by a variety of non-target species such as the Eastern cottontail, striped skunk, raccoon, red fox, coyote, white-footed mouse (*Peromyscus leucopus*), house mouse (*Mus musculus*), and short-tailed shrew (*Blarina brevicauda*) (Hamilton, Jr. 1934, Grizzell, Jr. 1955, Dolbeer et al. 1991).

Fumigants would be used in active burrows only, which would minimize risk to non-targets. Dolbeer et al. (1991) found a total of one cottontail rabbit and three mice (*Permyscus* sp.) in three of the 97 woodchuck burrows treated with gas cartridges during the late-summer. During 2,064 trap nights at 86 woodchuck burrow entrances targeting small mammals, Swihart and Picone (1995) captured 99 individuals of four small mammal species, which included short-tailed shrews, meadow voles (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), and white-footed mice. Risks to non-targets can be minimized by treating only burrows that appear to be active (Dolbeer et al. 1991). There are no secondary poisoning risks involved with the use of gas cartridges as the gas produced dissipates

into the atmosphere shortly after activation. Primary risks to non-targets would be minimized by treating only active, by covering entrances of burrows, and by following the pesticide label. Although non-targets could be present in burrows, even after WS' conducts site investigations, the risks are relatively low and unintentional take from the use of fumigants would be limited. In addition, applicators using gas cartridges must exercise caution to avoid burns to the skin or surrounding vegetation.

Zinc phosphide is a metallic toxicant registered for use on woodchucks and muskrat damage management in Massachusetts. The odor of zinc phosphide is attractive to rodents but repulsive to most other animals. This safety feature would cause most other species to regurgitate any zinc phosphide baits they may consume. Aluminum phosphide is a fumigant for certain burrowing rodents and in structures. Aluminum phosphide reacts with atmospheric moisture to release phosphine (PH_3) gas. Phosphine gas is a potent mammalian toxicant. A common concern with the use of rodenticides is the potential non-target risks. All these chemicals are regulated by EPA under FIFRA, and the MDAR and their use by WS' personnel is carefully defined in WS' directives. All label requirements of zinc and aluminum phosphide pesticides would be followed to minimize non-target hazards.

Based on a thorough Risk Assessment, APHIS has concluded that, when the WS' program uses chemical methods, including those referenced above, in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible effects on the environment (USDA 1997).

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by large rodents, the use of such methods can result in the incidental take of unintended species. However, these occurrences are rare and should not affect the overall populations of any species under the current program. Since FY 1996, no lethal non-target species take by WS has occurred in Massachusetts during activities to reduce damage or threats to human safety from large rodents; however, one common snapping turtle (*Chelydra serpentina*) was released alive from a conibear trap. Methods used during large rodent control activities in Massachusetts were selective for the target species; however, other non-targets such river otter, mink, snakes or fish could be lethally taken with conibear traps or other methods.

WS' take of non-target species and unintentional take of target species in the Commonwealth is expected to continue to be extremely low to non-existent. WS would continue to monitor the take of non-target species to ensure program activities or methodologies used in large rodent damage management do not adversely impact non-targets.

T&E Species Effects

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. SOPs to avoid T&E effects are described in Chapter 3 of this EA.

Federally Listed Species – The current list of species designated as threatened and endangered in Massachusetts as determined by the USFWS and the National Marine Fisheries Services was obtained and reviewed during the development of this EA. Appendix C contains the list of species currently listed in the Commonwealth along with common and scientific names.

The New England Field Office of the USFWS has developed a website[10] which provides up-to-date

[10] The New England Field Office website for endangered species consultation could be found at www.fws.gov/newengland/endangeredspec-consultation.htm during the development of this EA

species occurrence information and provides an outline for action agencies to assist in determining whether consultation for projects is needed under Section 7 of the ESA. WS would review the website and the online measures on a site-by-site basis to determine if any T&E species are located within the project area in order to conclude with a determination of effects. If T&E species are not present in the project area based on review of the website, WS would conclude the project would have "*no effect*" on T&E species based on the absence of those species in the project area; therefore, no further consultation would occur with the USFWS as indicated by the website and pursuant to Section 7 of the ESA. If, after review of the procedures on the website, WS determines T&E species may be present in a project area based on information provided on the website, WS would follow those procedures outlined on the website to conclude with a determination of effects and the need for further consultation pursuant to Section 7.

Commonwealth Listed Species – WS has obtained and reviewed the list of T&E or species of special concern (see Appendix D) designated by the Commonwealth of Massachusetts and has determined that the proposed WS' activities would have no effect on any species listed as vulnerable or threatened and endangered. If WS' activities are requested that may be beneficial to species listed by the Commonwealth as vulnerable, threatened, or endangered by enhancing reproduction or survival of individuals through reduction of harassment, competition, or predation associated with large rodents, WS would initiate consultation with the Commonwealth prior to start of any action.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

Under a technical assistance alternative, WS would have no direct impact on non-target species, including T&E species. Methods recommended or provided through loaning of equipment could be employed by those persons requesting assistance. Recommendations would be based on WS' Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with the methods being recommended or loaned. Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If methods are employed, as recommended by WS and cooperating agencies, the potential impacts to non-targets are likely similar to the proposed action. If recommended methods and techniques are not followed or if other methods are employed that were not recommended, the potential impacts on non-target species, including T&E species is likely higher compared to the proposed action.

The potential impacts of harassment and exclusion methods to non-target species would be similar to those described under the proposed action. Harassment and exclusion methods are easily obtainable and simple to employ. Since identification of targets occurs when employing shooting as a method, the potential impacts to non-target species are likely low under this alternative.

Those persons experiencing damage from large rodents may implement methods and techniques based on the recommendations of WS. The potential for impacts would be based on the knowledge and skill of those persons implementing recommended methods. Potential impacts from providing only technical assistance could be greater than those described in the proposed action if those persons experiencing damage do not implement methods or techniques correctly. Incorrectly implemented methods or techniques recommended by WS could lead to an increase in non-target take.

If requestors are provided technical assistance but do not implement any of the recommended actions, the potential impacts to non-targets would be lower compared to the proposed action. If those persons requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to the proposed action. Methods or techniques not

implemented as recommended or used inappropriately would likely increase potential impacts to non-targets. Therefore, the potential impacts to non-targets, including T&E species would be variable under a technical assistance only alternative. It is possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of large rodents, which could lead to unknown effects on local non-target species populations, including some T&E species (White et al. 1989, USDA 1997, USFWS 2001, FDA 2003).

The ability to reduce negative impacts caused by large rodents to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions. It would be expected that this alternative would have a greater chance of reducing damage than Alternative 3 since WS would be available to provide information and advice.

Alternative 3 – No Large Rodent Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with large rodent damage management activities in the Commonwealth. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Large rodents could continue to be taken by property owners, by licensed PAC agents and through the issuance of depredation permits by the MDFW. Risks to non-targets and T&E species would continue to occur from those persons who implement large rodent damage management activities on their own or through recommendations by the other federal, Commonwealth, and private entities. Although some risks occur from those persons that implement large rodent damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

The ability to reduce negative impacts caused by large rodents to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

A common concern is the potential adverse affects methods available could have on human health and safety. The threats to human safety of methods available under the alternatives are evaluated below by each of the alternatives.

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

The cooperator requesting assistance is made aware through a MOU, cooperative service agreement, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods.
Under the proposed action, those methods discussed in Appendix B, would be integrated to resolve and prevent damage associated with large rodents in the Commonwealth. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under the proposed action. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from large rodents. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed

as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives. Lethal methods available under the proposed action would include the use of firearms, conibear traps, toxicants and live-capture followed by euthanasia.

WS' employees who conducted large rodent damage management activities are knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. That knowledge is incorporated into the decision-making process inherent with the WS' Decision Model that is applied when addressing threats and damage caused by large rodents. When employing lethal methods, WS' employees considered risks to human safety when employing those methods based on location and method. Risks to human safety from the use of methods is likely greater in urban areas when compared to rural areas that are less densely populated. Consideration is also give to the location where damage management activities would be conducted based on property ownership. If locations where methods would be employed occur on private property in rural areas where access to the property is controlled and monitored, the risks to human safety from the use of methods is likely less. If damage management activities occur at parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety increases. Activities would generally be conducted when human activity is minimal (*e.g.*, early mornings, at night) or in areas where human activities are minimal (*e.g.*, in areas closed to the public).

The use of live-capture traps have also been identified as a potential issue. Live-capture traps are typically set in situations where human activity is minimal to ensure public safety. Traps rarely cause serious injury and are triggered through direct activation of the device. Live-capture traps available for large rodents are box/cage or suitcase type traps where large rodents enter and trigger a spring loaded or gravity dropped door or lid. Therefore, human safety concerns associated with live traps used to capture large rodents require direct contact to cause bodily harm. Therefore, if left undisturbed, risks to human safety would be minimal. A formal risk assessment of live-capture methods determined risks to human safety associated with the use patterns of those methods was low (USDA 1997).

The use of restraining devices (*e.g.*, foot-hold traps) and body-gripping traps have also been identified as a potential issue. Restraining devices and body-gripping traps are typically set in situations where human activity is minimal to ensure public safety. Restraining devices and body-gripping traps rarely cause serious injury and are triggered through direct activation of the device. Therefore, human safety concerns associated with restraining devices and body-gripping traps used to capture wildlife, including large rodents, require direct contact to cause bodily harm. Again, restraining devices are not located in high-use areas to ensure the safety of the public and pets. Signs warning of the use of those tools in the area are posted for public view at access points to increase awareness that those devices are being used and to avoid the area, especially pet owners.

Other live-capture devices, such as catch poles, hand nets and net guns pose minor safety hazards to the public since they are either used by hand or activation of the device occurs by trained sonnel after target species are observed in the capture area of the net. Rabies poles and hand nets may be used to capture large rodents that have entered buildings or become trapped in structures such as garbage dumpsters or storm water drains. Net guns and launchers are not commonly used to capture large rodents but could be utilized for special projects.

Safety issues due arise related to misusing firearms and the potential human hazards associated with firearm use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearm safety training course and to remain certified for firearm use, WS' employees must attend a re-certification safety training course in accordance with WS Directive 2.615. As a condition of employment, WS' employees who carry and use firearms are subject to the Lautenberg Domestic Confiscation Law, which

prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence (18 USC § 922(g)(9)). A thorough safety assessment would be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS would work closely with cooperators requesting assistance to ensure all safety issues are considered before the use of firearms are deemed appropriate for use. All methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of methods. A risk assessment conducted during the development of WS' programmatic FEIS, determined the risks to human safety from the use of firearms was low based on the use profile of the method (USDA 1997).

The use of immobilizing drugs would only be administered to animals that have been live-captured using other methods or administered through injection using a jabstick. Immobilizing drugs used to sedate wildlife are used to temporary handle and transport animals to lessen the distress of the animal from the experience and for the safety of handlers. Drug delivery to immobilize mammals is likely to occur on site with close monitoring of the animal to ensure proper care of the animal. Immobilizing drugs are fully reversible with a full recovery of sedated animals occurring. A list and description of immobilizing drugs available for use under the identified alternatives can be found in Appendix B and are further described in WS' programmatic FEIS (USDA 1997).

Euthanizing drugs would be administered under similar circumstances to immobilizing drugs. Euthanizing drugs would be administered to animals live-captured using other methods. Euthanized animals would be disposed of in accordance with WS Directives and therefore, would not be available for harvest and consumption. If mammals were immobilized for sampling or translocation and released, risks could occur to human safety if harvest and consumption occurred. SOPs employed by WS to reduce risks are discussed in Chapter 3 and in Appendix B.

All WS' personnel who handle and administer chemical methods would be properly trained in the use of those methods. Training and adherence to agency directives would ensure the safety of employees applying chemical methods. All lethally taken large rodent retrieved would be disposed of in accordance with WS Directive 2.515. All euthanasia would occur in the absence of the public to further minimize risks, whenever possible. SOPs to reduce threats to human safety are further described in Chapter 3 of this EA.

The recommendation of repellents or the use of those repellents registered for use to disperse large rodents in the Commonwealth could occur under the proposed action as part of an integrated approach to managing large rodent damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use or recommendation of repellents are addressed under the technical assistance only alternative (Alternative 2) and would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Risks to human safety from the use of pesticides could occur either through direct exposure of the chemical or exposure to the chemical from large rodents that have been lethally taken. The only pesticides currently registered for use in Massachusetts are gas cartridges, aluminum phosphide and zinc phosphide that could be used for woodchuck and muskrat damage management. Zinc phosphide is currently registered with the EPA to manage damage associated with rodents, including woodchucks and

muskrats, and can be formulated on a variety of bait types depending on the treatment sites listed on the label. The mixing and storage of zinc phosphide treated bait occurs in controlled areas that are not accessible by the public. Therefore, risks to public safety from the preparation of zinc phosphide are minimal. Some risks do occur to the handlers during the mixing process from inhalation and direct exposure on the skin and eyes. Adherence to label requirements during the mixing and handling of zinc phosphide treated bait for use of personal protective equipment ensures the safety of WS' personnel handling and mixing treated bait. Therefore, risks to handlers and mixers that adhere to the personal protective equipment requirements of the label are low.

Locations where treated bait may be placed are determined based on product label requirements (*e.g.*, specific location restrictions), the target rodent species use of the site (determined through pre-baiting and an acclimation period), on non-target use of the area (areas with non-target activity are not used or abandon), and based on human safety (*e.g.*, in areas restricted or inaccessible by the public or where warning signs have been placed). Once appropriate locations are determined, treated baits are placed by hand in burrows or bait platforms per label requirements. Once baited, locations are monitored for non-target activity and to ensure the safety of the public.

The pre-baiting period allows for treated bait to be placed at a location where target rodents are conditioned to feed on the bait, providing a higher likelihood that treated bait is consumed by the target species which makes it unavailable for potential exposure to humans. To be exposed to the bait, someone would have to approach a bait site and handle treated bait. If the bait has been consumed by target species or is removed by WS, then treated bait is no longer available and human exposure to the bait could not occur. Therefore, direct exposure to treated bait during the baiting process would only occur if someone approached a bait site that contained bait and if treated bait was present, would have to handle treated bait.

No adverse affects to human safety have occurred from WS' use of methods to alleviate large rodent damage in the Commonwealth from FY 1996 through FY 2011. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low.

Information on registered toxicants and gas cartridges is provided here to provide background and an understanding of potential risks to human safety.

Zinc Phosphide is a finely ground gray-black powder that is practically insoluble (solubility = 1 ppm) in water and alcohol; therefore, it is unlikely to be mobile in soils. It breaks down to elemental zinc and phosphine gas when exposed to moisture or under acidic conditions. The decomposition rate of zinc phosphide in the soil depends on soil moisture and pH, with complete decomposition in 30 days in moderately moist soils. The residue of zinc phosphide is not expected to accumulate in the soils between applications, or in animal tissues. The phosphine gas produced during breakdown is a colorless gas with a high vapor pressure and so is generally prevented from accumulating in low areas. Ultimately, the phosphine is transformed into inorganic phosphate (USDA 1997).

Zinc phosphide is available to certified pesticide applicators in Massachusetts. Any non-WS' programs that might employ zinc phosphide for purposes specified on product labels would not collectively produce cumulative effects for the same reasons outlined under this alternative. Therefore, no significant cumulative effects on human health and safety are expected from all combined activities involving zinc phosphide for the management of damage caused by species for which the product is registered for use.

Aluminum phosphide is available in tablet or pellet form as a fumigant for rodent burrows, to manage damage being caused by woodchucks. It is not soluble in water, but will react with moist air to produce phosphine gas. It is stable under dry conditions. It is not persistent in soil systems because it decomposes

to phosphine gas rapidly on contact with moisture and soil. The rate of decomposition of the tablets varies from less than three and up to five days or more, depending on moisture and temperature according to the Material Safety Data Sheet. Ultimately, phosphine gas is transformed into harmless inorganic phosphate. Phosphine gas is a colorless gas with a vapor pressure of 33.5 atm at 20°C, much higher than other fumigants. The high vapor pressure generally prevents the accumulation of this gas in low areas, in spite of a specific gravity of 1.17, compared to specific gravity for air of 1.0. Aluminum phosphide is insoluble in water and therefore, not expected to be particularly mobile in soils. At the same time, accumulation in soils is not significant due to the decomposition of Aluminum phosphide in the presence of moisture. Aluminum phosphide does not accumulate in animal tissue (USDA 1997).

Aluminum phosphide is available to certified pesticide applicators in Massachusetts. However, because of properties and fate of this chemical, such use would not introduce any cumulative effects which might adversely impact human health and safety. Therefore, no significant cumulative effects on human health and safety are expected from all combined activities involving aluminum phosphide use for the management of damage caused by rodents.

Sodium nitrate is the principle active chemical in gas cartridges, is a naturally-occurring substance. Although stable under dry conditions, it is readily soluble in water and likely to be highly mobile in soils. In addition, dissolved nitrate is very mobile, moving quickly through the vadose zone to the underlying water table (Bouwer 1989). Burning sodium nitrate however, as in the use of a gas cartridge as a fumigant in a rodent burrow, is believed to produce mostly simple organic and inorganic gases, using all of the available sodium nitrate. In addition, the drinking water tolerance level for this chemical is 10 mg/L, a relatively large amount, according to EPA Quality Criteria for Water (EPA 1986*a*, EPA 1986*b*). The gas along with other components of the cartridge, are likely to form oxides of nitrogen, carbon, phosphorus, and sulfur. Those products are environmentally non-persistent because they are likely to be metabolized by soil microorganisms or enter their respective elemental cycles. In rodent cartridges, sodium nitrate is combined with seven additional ingredients; sulfur, charcoal, red phosphorus, mineral oil, sawdust, and two inert ingredients. None of the additional ingredients in this formulation is likely to accumulate in soil, based on their degradation into simpler elements by burning the gas cartridge. Sodium nitrate is not expected to accumulate in soils between applications, nor does it accumulate in the tissues of target animals (EPA 1991). No gas residues remain at the treatment site where either formulation is used, for any period of time (USDA 1997), and so, no significant cumulative effects from the presence of gases can be expected.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations of methods and the demonstration of methods only to resolve damage. WS would only provide technical assistance to those persons requesting assistance with large rodent damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Risks to human safety from the use of non-lethal methods were considered low when evaluated in a formal risk assessment in WS' programmatic FEIS (USDA 1997). Risks to human safety associated with non-chemical methods such as resource management methods (*e.g*., crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, and cage traps were considered low based on their use profile for alleviating damage associated with wildlife (USDA 1997).

Under a technical assistance only alternative, the use of zinc phosphide would not be available to the general public. Personnel employing gas cartridges are present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with gas cartridges

during ignition and storage, safety precautions associated with the use of these methods, when adhered to, pose minimal risks to human safety and primarily occur to the handler.

Personnel employing hand nets, net guns and net launchers are present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with net gun and launcher blank cartridges during ignition and storage, safety precautions associated with the use of these methods, when adhered to, pose minimal risks to human safety and primarily occur to the handler. Net guns and launchers would not be employed in areas where public activity is high which further reduces the risks to the general public. Net guns and launchers would be employed in areas where public access is restricted whenever possible to reduce risks to human safety. Overall, nets are not commonly used for live capturing large rodents and their use would pose minimal risks to the public.

The use of chemical methods that are considered non-lethal would also be available under this alternative. Chemical methods available would include repellents. There are several chemical repellents registered for use to manage beaver, porcupine and woodchuck in the Commonwealth. Nothing is registered as a repellent for muskrats in Massachusetts. Rodent repellents require use odor, taste or tactile agents to achieve the desired affects on target species. Repellents using coyote and/or fox urine are registered for use in repelling beaver, porcupine and woodchuck. These scents make them believe a predator is nearby. Capsaicin/hot pepper based repellents are registered as taste deterrent in repelling beaver, porcupine and woodchucks by causing a burning sensation in the mouth and mucous membranes. Tactile repellents based on polybutene are available to deter beaver chewing on a variety of tree species.

The recommendation of shooting with firearms as a method of direct lethal take could occur under this alternative when lethal take has been authorized through the issuance of a depredation permit by the MDFW, by a property owner or tenant, their immediate family or full time employees, by a licensed hunter during the legal season for porcupines and woodchucks and by a PAC agent. Safety issues do arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms are minimal. If firearms are employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations of the use of firearms by WS would include human safety considerations. Since the use of firearms to alleviate large rodent damage would be available under any of the alternatives and the use of firearms by those persons experiencing large rodent damage could occur whether WS was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives.

If non-chemical methods are employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to the proposed action. If methods are employed without guidance from WS or applied inappropriately, the risks to human safety could increase. The extent of the increased risk would be unknown and variable. Non-chemical methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

Given the use profile of many methods to manage damage and threats associated with large rodents, the risks to human safety from the use of those methods are low when employed by WS (USDA 1997). The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate large rodent damage could threaten human safety. However, when used appropriately methods available to alleviate damage would not threaten human safety.

Alternative 3 – No Large Rodent Damage Management Conducted by WS

Under the no large rodent damage management alternative, WS would not be involved with any aspect of managing damage associated with large rodents in the Commonwealth, including technical assistance. Due to the lack of involvement in managing damage caused by large rodents, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from large rodents from conducting damage management activities in the absence of WS' assistance. The direct burden of implementing permitted methods would be placed on those persons experiencing damage.

Similar to the technical assistance only alternative, the pesticide zinc phosphide would not be available under this alternative to those persons experiencing damage or threats from large rodents. Since most methods available to resolve or prevent large rodent damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those persons not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

Another concern often raised is the potential impact the proposed action would have on the aesthetic value that people often regard for large rodents. The effects of the alternatives on this issue are analyzed below by alternative.

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of large rodents to resolve damage and threats. In some instances where large rodents are dispersed or removed, the ability of interested persons to observe and enjoy those large rodents would likely temporarily decline. The ability to enjoy wetlands created and/or manipulated by beaver and muskrat may also temporarily decline.

Even the use of exclusionary devices can lead to the dispersal of wildlife if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, the wildlife would likely disperse to other areas where resources are more vulnerable. The use of lethal methods would result in temporary declines in local populations resulting from the removal of large rodents to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those large rodents responsible for the resulting damage. Therefore, the ability to view and enjoy large rodents would still remain if a reasonable effort is made to locate large rodents outside the area in which damage management activities occurred. Those large rodents removed by WS are those that could be removed by the person experiencing damage when permitted by the MDFW or a local municipal BOH or through legal hunting/shooting, trapping or use of pesticides by the property owner or tenant or their agent.

Activities by WS would only be conducted where a request for assistance has been received and only after an agreement for such services have been signed by the cooperator. Some aesthetic value would be gained by the removal of large rodents and the return of a more natural environment, including the return of other native wildlife and plant species that may be suppressed or displaced by high large rodent densities.

Since those large rodents removed by WS under this alternative could be removed with a depredation

permit issued by the MDFW or a local BOH or through other legal means, WS' involvement in taking those large rodents would not likely be additive to the number of large rodents that could be taken in the absence of WS' involvement.

WS' take of large rodents from FY 1996 through FY 2011 has been of low magnitude compared to the total mortality. WS' activities are not likely additive to the large rodents that would be taken in the absence of WS' involvement. Although large rodents removed by WS are no longer present for viewing or enjoying, those large rodents would likely be removed by the property owner or manager through the issuance of depredation permit or other legal means. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of large rodents and WS' large rodent damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of large rodents. The impact on the aesthetic value of large rodents and the ability of the public to view and enjoy large rodents under the proposed action would be similar to the other alternatives and is likely low.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

If those persons seeking assistance from WS were those persons likely to conduct large rodent damage management activities in the absence of WS' involvement, then technical assistance provided by WS would not adversely affect the aesthetic value of large rodents in the Commonwealth similar to Alternative 1. Large rodents could be lethally taken under this alternative by those entities experiencing large rodent damage or threats which would result in localized reductions in the presence of large rodents at the location where damage was occurring. The presence of large rodents where damage was occurring would be reduced where damage management activities are conducted under any of the alternatives. Even the recommendation of non-lethal methods is likely to result in the dispersal of large rodents from the area if those non-lethal methods recommended by WS are employed by those persons receiving technical assistance. Therefore, technical assistance provided by WS would not prevent the aesthetic enjoyment of large rodents since any activities conducted to alleviate large rodent damage could occur in the absence of WS' participation in the action, either directly or indirectly.

Alternative 3 – No Large Rodent Damage Management Conducted by WS

Under the no large rodent damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of large rodents in the Commonwealth. Those persons experiencing damage or threats from large rodents would be responsible for researching, obtaining, and using all methods as permitted by Commonwealth and local laws and regulations. Large rodents would continue to be dispersed and lethally taken under this alternative in the Commonwealth. Lethal take could continue to occur through the issuance of depredation permits by the MDFW, by a local BOH and through other legal lethal methods.

Since large rodents would continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy large rodents would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of large rodents dispersed or taken since WS' has no authority to regulate take or the harassment of large rodents in the Commonwealth. The MDFW with management authority over large rodents could continue to adjust all take levels based on population objectives for large rodents in the Commonwealth. Therefore, the number of large rodents lethally taken annually under depredation permits, legal hunting and trapping and problem animal control are regulated and may be adjusted as necessary by the MDFW.

Those persons experiencing damage or threats could continue to use those methods they feel appropriate to resolve large rodent damage or threats, including lethal take. WS' involvement in large rodent damage

management is therefore, not additive to the large rodents that could be taken in the Commonwealth. The impacts to the aesthetic value of large rodents would be similar to the other alternatives.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

As discussed previously, a common issue often raised is concerns about the humaneness of methods available under the alternatives for resolving large rodent damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

Under the proposed action, WS would integrate methods using WS' Decision Model as part of technical assistance and direct operational assistance. Methods available under the proposed action could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, non-lethal methods would be used by WS which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), dam removal/destruction, exclusion devices, frightening devices, cage traps, rabies poles, nets, and repellents.

As discussed previously, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering. Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the multitude of attitudes on the meaning of humaneness and the varying perspectives on the most effective way to address damage and threats in a humane manner, agencies are challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS is to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS would continue to evaluate methods and activities to minimize the pain and suffering of methods addressed when attempting to resolve requests for assistance.

Some methods have been stereotyped as "*humane*" or "*inhumane*". However, many "humane" methods can be inhumane if not used appropriately. For instance, a live trap is generally considered by most members of the public as "*humane*". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, the goal is to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of box/cage traps, nets, and repellents, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods are from injuries to animals while restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively

deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

If large rodents are to be live-captured by WS, WS' personnel would be present on-site during capture events or methods would be checked frequently to ensure large rodents captured are addressed in a timely manner to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under the proposed action, lethal methods could also be employed to resolve requests for assistance to resolve or prevent large rodent damage and threats. Lethal methods would include shooting, pesticides, gas cartridges, conibear traps and euthanasia after large rodents are live-captured. WS' use of euthanasia methods under the proposed action would follow those required by WS' directives (WS Directive 2.430) and recommended by the AVMA for use on free-ranging wildlife under field conditions (AVMA 2007).

The euthanasia methods being considered for use under the proposed action for live-captured large rodents are euthanasia drugs, carbon dioxide or a single shot to the head. A single shot to the neck or heart may be utilized in field conditions if the animal is suspected to be positive for rabies and requires testing, particularly after a possible exposure to a human or domestic animal. Although a shot to the neck or heart do not meet the AVMA panel's definition of euthanasia because it does not cause immediate unconsciousness (AVMA 2007), it may be the only option in some field situations due to the risks of transporting a live rabies positive animal. The AVMA guideline on euthanasia lists euthanasia drugs, shot to the head and carbon dioxide as an acceptable method of euthanasia for free-ranging large rodents which can lead to a humane death (AVMA 2007). The use of a euthanasia drugs, a shot to the head or carbon dioxide for euthanasia would occur after the animal has been live-captured and away from public view.

WS' personnel that employ firearms and quick kill conibear traps in the field to address large rodent damage or threats to human safety would be trained in the proper placement of shots and/or proper placement of traps to ensure a timely and quick death.

Use of foothold traps is currently prohibited by Massachusetts statute. However, MDFW has acknowledged that the Commonwealth does not have the authority to restrict WS' use of banned traps on federal land. An issue when dealing with aquatic rodent species is the use of foothold traps to create drowning sets and the humaneness of drowning. There is considerable debate and disagreement among animal interest groups, veterinarians, wildlife professionals, fur trappers, and nuisance wildlife control specialists on this issue. The debate centers on an uncertainty as to whether the drowning animals are rendered unconscious by high levels of CO_2 and are thus insensitive to distress and pain (Ludders et al. 1999).

The AVMA identifies drowning as an unacceptable method of euthanasia (Beaver et al. 2001, AVMA 2007), but provides no literature citations to support this position. Ludders et al. (1999) concluded drowning is not euthanasia based on the animals not dying from CO_2 narcosis, and reported CO_2 narcosis does not occur until 95 millimeters of mercury in arterial blood is exceeded. Ludders et al. (1999) showed death during drowning is from hypoxia and anoxia; thus, animals experience hypoxemia. Ludders et al. (1999) concluded that animals that drown are distressed because of stress related hormones, epinephrine and norepinephrine, and therefore drowning is not euthanasia.

Carbon dioxide (CO_2) causes death in animals by hypoxemia and some animals (cats, rabbits, and swine) are distressed before death (Beaver et al. 2001). Even though those animals are distressed, the AVMA (Beaver et al. 2001) states this death is an acceptable form of euthanasia. Thus, the AVMA does not preclude distress or pain in euthanasia. In fact, the AVMA supports inducing hypoxemia-related distress

when necessary to reduce total distress, because reducing total distress is a more humane death.

Death by drowning in the classical sense is caused by the inhalation of fluid into the lungs and is referred to as "*wet*" drowning (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that all submerged beaver do not die from wet drowning, but die of CO_2-induced narcosis, and the AVMA has stated the use of CO_2 is acceptable (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that after beaver were trapped and entered the water, they struggled for two to five minutes, followed by a period of reflexive responses. Andrews et al. (1993) stated that with some techniques that induce hypoxia, some animals have reflex motor activity followed by unconsciousness that is not perceived by the animal. Gilbert and Gofton (1982) stated it is unknown how much conscious control actually existed at this stage and they stated anoxia may have removed much of the sensory perception by five to seven minutes post submersion.

However, Gilbert and Gofton (1982) have been criticized because levels of CO_2 in the blood were not reported (Ludders et al. 1999) and there was insufficient evidence that the beaver in their study were under a state of CO_2 narcosis when they died (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study, to W. MacCallum, MDFW, June 15, 1998). Adding to the controversy, Clausen and Ersland (1970) did measure CO_2 in the blood for submersed restrained beaver, yet none of the beaver in their study died, so Clausen and Ersland (1970) could not determine if beaver died of CO_2 narcosis. Clausen and Ersland (1970) demonstrated that CO_2 increased in arterial blood while beaver were submersed and CO_2 was retained in the tissues. While Clausen and Ersland (1970) did measure the amounts of CO_2 in the blood of submersed beaver, they did not attempt to measure the analgesic effect of CO_2 buildup to the beaver (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study, to W. MacCallum, MDFW, June 15, 1998). When beaver are trapped using foothold traps with intent to "*drown*", the beaver are exhibiting a flight response. Gracely and Sternberg (1999) reported that there is stress-induced analgesia resulting in reduced pain sensitivity during fight or flight responses. Environmental stressors that animals experience during flight or fight activate the same stress-induced analgesia (Gracely and Sternberg 1999).

The use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic mammals such as beaver and muskrat. Trapper education manuals and other wildlife damage management manuals written by wildlife biologists recommend drowning sets for foothold traps set for beaver (Howard et al. 1980, Randolph 1988, Bromley et al. 1994, Dolbeer et al. 1994, Miller and Yarrow 1994). In some situations, drowning trap sets are the most appropriate and efficient method available to capture beaver and muskrat. For example, a drowning set attachment should be used with foothold traps when capturing beaver to prevent the animals from injuring themselves while restrained, or from escaping (Miller and Yarrow 1994). Animals that drown die relatively quickly (*e.g.*, within minutes) versus the possible stress of being restrained and harassed by people, dogs, and other wildlife before being euthanized. Drowning sets make the captured animal and trap less visible and prevents injury from the trapped animal (*i.e.*, bites and scratches) to people who may otherwise approach a restrained animal. Furthermore, the sight of dead animals may offend some people. Drowning places the dead animal out of public view. Some sites may be unsuitable for body-gripping traps or snares because of unstable banks, deep water, or a marsh with a soft bottom, but those sites would be suitable for foothold traps.

Given the short time period of a drowning event, the possible analgesic effect of CO_2 buildup, the minimal if any pain or distress on drowning animals, the AVMA acceptance of hypoxemia as euthanasia, the AVMA acceptance of a minimum of pain and distress during euthanasia, and the acceptance of catching and drowning muskrats approved by International Humane Trapping Standards (Fur Institute of Canada 2000), WS concludes that drowning, though rarely used by WS, is acceptable.

Research and development by WS has improved the selectivity and humaneness of management

techniques. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations where non-lethal damage management methods are not practical or effective. Personnel from WS are experienced and professional in their use of management methods. Consequently, management methods are implemented in the most humane manner possible under the constraints of current technology. Those methods discussed in Appendix B to alleviate large rodent damage and/or threats in the Commonwealth, could be used under any of the alternatives by those persons experiencing damage regardless of WS' direct involvement. Therefore, the issue of humanness associated with methods would be similar across any of the alternatives since those methods could be employed. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. SOPs that would be incorporated into WS' activities to ensure methods are used by WS as humanely as possible are listed in Chapter 3.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

The issues of humaneness of methods under this alternative are likely to be perceived to be similar to humaneness issues discussed under the proposed action. This perceived similarity is derived from WS' recommendation of methods that some consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requestor employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to the proposed action.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target large rodent species and to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of large rodents or improperly identifying the damage caused by large rodents along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the pain and suffering are likely to be regarded as greater than those discussed in the proposed action.

Alternative 3 – No Large Rodent Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of large rodent damage management in the Commonwealth. Those persons experiencing damage or threats associated with large rodents could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the general public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the general public to use to resolve damage and threats caused by large rodents. Similar to Alternative 2, the lack of understanding of large rodent behavior or proper method use could lead to situations where methods are employed that could be perceived as inhumane.

Issue 6 - Effects of Beaver and Muskrat Damage Management on Wetlands

Some people are concerned about the effects of the proposed action and alternatives on wetland ecosystems and that removal of beaver and muskrat, breaching, or modifying beaver dams in an area would result in the loss of wetland habitat and the plant and animal species included in those wetlands. Over time, beaver dams can establish new, but different wetlands. The USACE and EPA regulatory definition of a wetland (40 CFR 232.2) is: "*Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas*."

Alternative 1 - Continuing the Current Integrated Approach to Managing Large Rodent Damage (Proposed Action/No Action)

Under the proposed action, methods would be employed that would result in changes to existing wetlands in natural and man-made palustrine and riparian zones. In some instances where muskrats and beaver are dispersed, removed, or the population is reduced, wetland areas may experience changes in wetland vegetation, soil structure and floral and faunal composition. This may result from water levels stabilizing or lowering because dams decay or are destroyed by weather events, drying or saturation of soils and increased growth of terrestrial and aquatic plants.

Beaver and muskrat alter palustrine and riparian areas by feeding on vegetation, building shelters or digging burrows and in the case of beaver, dam building. Beaver creation or modification of wetlands through damming can have a significant effect on local ecosystems by raising surface water levels and water tables. Although muskrats do not modify wetlands to the extent of beavers, their burrowing can weaken or destroy water retention structures such as levees, dams, berms which could result in significant damage or loss of wetlands.

WS operations routinely incorporate beaver removal with dam breaching and/or installation of water leveler or exclusion devices. Dams are breached and installation of flow control and exclusionary structures is done by hand. No explosives are used by WS in Massachusetts to breach or remove beaver dams. No heavy equipment, such as backhoes or bulldozers, is used by WS in these damage reduction and wildlife enhancement activities, although they may be utilized by cooperators or their agents. However, WS may utilize small all terrain or amphibious vehicles and/or watercraft for transporting personnel, equipment and supplies to worksites.

These activities normally take place on small watershed streams, tributary drainages, and ditches and can best be described as small, exclusive projects conducted to restore water flow through previously existing channels. Only that portion of the dam blocking the stream or ditch channel is altered or breached, usually with the intent of returning water levels and flow rates to historical levels or to a level that eliminates damage threats or habitat alteration that is acceptable to the property owner or resource manager. WS' activities would have minimal direct impact to wetland vegetation or soil structure during breaching or installation of flow control or exclusionary devices.

Beaver were extirpated from Massachusetts and were not a component of the natural environment for almost 200 years. During this period, the landscape was dominated by free flowing river and streams and man-made impoundments. Beaver created and maintained wetlands have only been a major component of the landscape for the last 50 to 60 years. After the passage of Question 1, the beaver population expanded rapidly and has significantly impacted riparian and forest environments across the Commonwealth.

Although some new and emerging wetlands may be altered by WS activity through lowered water levels or return to a free flowing state, this activity would be limited to specific sites where threats to human health and safety and/or damage to property, agriculture or natural resources exist. In order to breach a beaver dam or install a flow control device and/or exclusionary structure in a wetland in Massachusetts, authorization must first be provided by the local Conservation Commission. Under the MWPA, WS must screen for potential impacts to rare wetland wildlife habitat by reviewing the NHESP developed town maps of Estimated Habitats of Rare Wildlife published in the Natural Heritage Atlas, and are available at the Mass GIS website.

MWPA Filing is required if a project is within Estimated Habitat of Rare Wildlife and a Notice of Intent (NOI) is required, a copy of the NOI must be sent to the NHESP, no later than the date of filing of the NOI with the applicable Conservation Commission, for review. Proponents are also required to file under MESA, unless a project qualifies for a MESA exemption. If a project is exempt from MESA review, proponents should be aware that a copy of the NOI must still be provided to the NHESP which may request surveys for rare species following standard protocols be conducted.

If any project is beyond the scope or authority of the local Conservation Commission, WS would consult and coordinate with the MDEP and if necessary the U.S. Army Corps of Engineers (USACE) and the EPA to ensure compliance with the MWPA, the Clean Water Act and any other state or federal laws or regulations before initiating any dam removal or flow control device installation projects.

Ultimate responsibility for permitting beaver trapping, flow control installation, exclusion and dam removal belongs to local BOHs and Conservation Commissions, MDFW, MDEP, USACE and the EPA depending on the situation and/or scope of the project based on Massachusetts and federal laws and regulations. All WS activities would be conducted in compliance with all applicable laws and regulations. The appropriate permitting or regulatory agency may allow, modify or halt WS activities before or during implementation if the potential effects on wetlands require further review.

Alternative 2 - Large Rodent Damage Management by WS through Technical Assistance Only

The issues regarding the effects on wetlands under this alternative are likely to be to be similar to wetlands issues discussed under the proposed action. This is derived from WS' recommendation of removal of beavers and muskrats, breaching of dams, and installation of flow control and exclusionary devices to eliminate or reduce beaver and muskrat damage and threats to human health and safety. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requestor employing those methods or employing an agent to employ them. Therefore, by recommending methods and thus a requester employing those methods, the impacts to wetlands would be similar to the proposed action.

WS would instruct and demonstrate the proper use and placement of flow control and exclusionary devices as well as the use of shooting and various traps legal for use in removing problem beaver. WS would also assist requestors by providing information on permit requirements, which municipal and state agencies need to be contacted to obtain appropriate permits to trap, breach dams, and install flow control and exclusionary devices. Assistance would also be provided in determining the presence of state listed species and submitting NOIs and other require documentation.

The efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor or their agent in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of beaver or improperly identifying the damage caused by beaver along with inadequate knowledge and skill in using methodologies to resolve the damage or

threat could lead to incidents with a greater probability of unforeseen impacts to wetlands. In those situations, the impacts to wetlands are likely to be regarded as greater than those discussed in the proposed action.

WS would not be responsible for ensuring that appropriate permitting is obtained or proper methods are implemented for trapping beaver and muskrats, reviewing sites for the presence of state listed T&E species, nor for properly installing flow control devices. This would be the responsibility of the individual property owner/manager or their agent who may or may not properly follow WS recommendations.

Alternative 3 – No Large Rodent Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of managing wetlands in the Commonwealth by controlling beaver and muskrat damage. Under the no large rodent damage management alternative, WS would not be involved with any aspect of managing damage associated with large rodents in the Commonwealth, including technical assistance. Due to the lack of involvement in managing damage caused by large rodents, no impacts to wetlands would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage due to wetland modification by beaver and/or muskrat from conducting damage management activities in the absence of WS' assistance. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Since methods available to resolve or prevent beaver and/or muskrat damage or threats related to wetland modification are available to anyone, effects on wetlands in the Commonwealth from the use of those methods are similar between the alternatives. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to wetlands and associated flora, fauna and T&E species. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks wetlands.

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

WS would continue to coordinate large rodent damage management activities and would report all take of large rodents to the MDFW and other state and federal agencies if appropriate. WS would also monitor program activities to ensure those activities are within the scope analyzed in this EA.

Issue 1 - Effects of Damage Management Activities on Large Rodent Populations

Evaluation of activities relative to target species indicated that program activities would likely have no cumulative adverse affects on large rodent populations when targeting those species responsible for damage. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of large rodents
- Human-induced mortality of large rodents through private damage management activities
- Human and naturally induced alterations of wildlife habitat

- Annual and perennial cycles in wildlife population densities

All those factors play a role in the dynamics of large rodent populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The actions taken to minimize or eliminate damage are constrained as to scope, duration, and intensity for the purpose of minimizing or avoiding impacts to the environment. WS uses the Decision Model to evaluate damage occurring, including other affected elements and the dynamics of the damaging species; to determine appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

With management authority over large rodent populations, the MDFW can adjust take levels, including the take of WS, to ensure population objectives for large rodents are achieved. Consultation and reporting of take by WS would ensure the MDFW considers any activities conducted by WS.

WS' take of large rodents in Massachusetts from FY 1996 through FY 2011 was of a low magnitude when compared to the total known take. The MDFW considers all known take when determining population objectives for large rodents and can adjust the number of large rodents that can taken for damage management purposes to achieve the population objectives. Any take by WS would occur at the discretion of the MDFW. Any large rodent population declines or increases that are associated with damage management activities would be the collective objective for large rodent populations established by the MDFW through the regulation of take. Therefore, the cumulative take of large rodents annually or over time by WS would occur at the desire of the MDFW as part of management objectives for large rodents in the Commonwealth.

No cumulative adverse impacts are expected from WS' large rodent damage management actions based on the following considerations:

1. Historical outcomes of WS' damage management activities on wildlife

Large rodent damage management activities are conducted by WS only at the request of a cooperator to reduce damage that is occurring or prevent damage from occurring and only after methods to be used are agreed upon by all parties involved. WS' monitors activities to ensure any potential impacts are identified and addressed. WS works closely with Commonwealth and federal resource agencies to ensure damage management activities are not adversely impacting large rodent populations and that WS' activities are considered as part of management goals established by those agencies. Historically, WS' activities to manage large rodents in Massachusetts have not reached a magnitude that would cause adverse impacts to large rodent populations in the Commonwealth.

2. SOPs built into the WS program

SOPs are designed to reduce the potential negative effects of WS' actions on large rodents, and are tailored to respond to changes in wildlife populations which could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in programs are defined through SOPs and implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992).

Issue 2 - Effects on Non-target Species Populations, Including T&E Species

Potential effects on non-target species from conducting large rodent damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of non-lethal methods during activities to reduce or prevent damage caused by large rodents has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or chemical repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion and repellents do not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods would not occur but would likely disperse those individuals to other areas. Exclusionary methods and repellents are often expensive and require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices and repellents would be somewhat limited to small, high-value areas and not used to the extent that non-targets are excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or nesting sites. The use of visual and auditory harassment and dispersion methods are generally temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods are not used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species followed by euthanasia have the potential to impact non-target wildlife through the take (killing) or capture of non-target species. Capture methods used are often methods that are set to confine or restrain target wildlife after being triggered by a target individual. Capture methods are employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that are employed to confine or restrain wildlife that are subsequently euthanized using humane methods since relocation is currently not considered. With all live-capture devices, non-target wildlife captured can be released on site if determined to be able to survive following release. SOPs are intended to ensure take of non-target wildlife is minimal during the use of methods to capture target wildlife. The use of firearms and euthanasia methods are essentially selective for target species since identification of an individual is made prior to the application of the method. Euthanasia methods are applied through direct application to target wildlife. Therefore, the use of those methods would not impact non-target species.

Chemical methods available for use under the proposed action are ZP, AP and gas cartridges which are described in Appendix B. Except for repellents that are applied directly to the affected resource, all chemical methods are employed using baits that are highly attractive to target species, used in known burrow sites and/or used in areas where exposure to non-targets are minimal. The use of those methods requires an acclimation period and monitoring of potential bait sites for non-target activity. All chemicals would be used according to product label which ensure that proper use would minimize non-target threats. WS' adherence to Directives and SOPs governing the use of chemicals also ensures non-target hazards are minimal.

All chemical methods would be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals would be stored and transported according the WS and Department of Transportation regulations. The amount of chemicals used or stored by WS would be minimal to ensure human safety. Based on this information, WS' use of chemical methods, as part of the proposed action, would not have cumulative impacts on non-targets.

All label requirements of ZP, AP, gas cartridges and repellents would be followed to minimize non-target hazards. As required by the ZP label and WS SOPs, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets are observed feeding on the pre-bait, the plots are abandoned and no baiting would occur at those locations. Once sites are baited, sites are monitored daily to further observe for non-target feeding activity. If non-targets are observed feeding on bait, those sites are abandoned. WS would retrieve all dead large rodents to the extent possible following treatment with ZP and AP to minimize any secondary hazards associated with or perceived to be associated with scavengers feeding on large rodent carcasses.

Repellents may also be used or recommended by the WS program in Massachusetts to manage large rodent damage. The active ingredients in numerous commercial repellents are capsaicin, pepper oil and carnivore urine which have been categorized by the EPA as "*generally recognized as safe*". Other repellents available contain the active ingredient polybutene, which when applied, creates a sticky surface which is intended to prevent gnawing and chewing. Characteristics of these chemicals and potential use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS' programs in Massachusetts when used according to label requirements.

The methods described in Appendix B all have a high level of selectivity and can be employed using SOPs to ensure minimal impacts to non-targets species. No non-targets were taken by WS during large rodent damage management activities from FY 1996 through FY 2011. Based on the methods available to resolve large rodent damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take under the proposed action of non-targets would not cumulatively impact non-target species.

On a project by project basis, WS will review the USFWS NEFO and MDFW NHESP websites to determine if federally or state listed T&E species could be present when a project is conducted. If, according to the websites, there are no known instances of a listed species being present in the project area, or if the species would not be present during the period the project is to be conducted, a "no effect" determination will be made and the project conducted. If listed species could be present, WS will consult with the USFWS and/or the MDFW to determine if listed species are or could reasonably be expected to be in the project area. If the determination that listed species do not occur in the project area or during the period the project will be conducted, once again, a "*no effect*" determination will be made and the project conducted.

If federally listed species are or could reasonably be expected to be in the project area during the period the project is conducted the appropriate informal or formal Section 7 Consultation will be conducted with the USFWS. If necessary, mitigation measures will be implemented at the recommendation of the USFWS to reduce or eliminate threats to T&E species. If a request is received by WS to conduct large rodent damage management activities to reduce predation on or habitat manipulation of federally listed T&E species, WS would initiate consultation for those activities.

If state listed species are determined to be present or possibly present at a large rodent damage management project site, WS will consult with MDFW and implement requested mitigation measures to reduce or eliminate direct threats to state listed species. Additionally, based on a review of the proposed activities, WS has determined some activities to manage beaver flooding may have an effect on Commonwealth-listed species. Before conducting installation of flow control devices or dam removal, pursuant to MWPA and NHESP requirements WS would consult and be permitted by the appropriate local Conservation Commission. To screen for additional potential impacts to rare wetland wildlife habitat, WS would review NHESP town maps of Estimated Habitats of Rare Wildlife. These maps show habitat that is based on documented occurrences of rare wetlands wildlife within the last 25 years. Estimated Habitat maps are also available from local Conservation Commissions, in the Natural Heritage

Atlas, and from Mass GIS.

If a project is within Estimated Habitat of Rare Wildlife and a NOI is required, a copy of the NOI must be sent to the NHESP, no later than the date of filing of the NOI with the applicable Conservation Commission, for review. WS would also need to file under MESA, unless a project qualifies for a MESA exemption. If a project is exempt from MESA review, a copy of the NOI would still be provided to the NHESP. NHESP may request that WS or the cooperator survey for rare species following standard protocols.

As specified in the MWPA Regulations, (310 CMR 10.37, 10.58(4)(b), and 10.59), the NHESP would respond within 30 days of receipt of a complete NOI filing. The response letter to the local Conservation Commission would provide a determination of whether or not the area to be altered by a proposed project is actual wetland Resource Area habitat for a state-listed rare wildlife species. The NHESP would also determine whether the proposed project would have an adverse effect on the actual habitat of rare wildlife. The NHESP response letter may contain conditions that must be adhered to in order to avoid an adverse effect to rare species habitat, or recommendations for revising the project prior to resubmission. The Conservation Commission may not issue an Order of Conditions for a project in Estimated Habitat until the NHESP has provided a determination letter. According to the regulations, the Conservation Commission shall presume the opinion of the NHESP to be correct. If the NHESP requires conditions or project modifications in order to prevent an "*adverse effect*", then these conditions must be included in the Order of Conditions. In such cases, a copy of the Order of Conditions must be mailed to the NHESP upon issuance.

Issue 3 - Effects of Damage Management Methods on Human Health and Safety

All non-chemical methods described in Appendix B are used within a limited time frame, are not residual, and do not possess properties capable of inducing cumulative adverse impacts on human health and safety. All non-chemical methods are used after careful consideration of the safety of those employing methods and to the public. All capture methods are employed where human activity is minimal to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed would have no effect on human safety. All methods are agreed upon by the requesting entities which are made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document between WS and the cooperating entity. SOPs also ensure the safety of the public from those methods used to capture or take wildlife. A formal risk assessment conducted by APHIS determined that WS' non-chemical methods, when used as intended, pose a low risk to human safety (USDA 1997). Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of employees and the public.

Personnel employing non-chemical methods would continue to be trained to be proficient in the use of those methods to ensure safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively impact human safety.

Repellents have been available for use to disperse large rodents from areas of application are available. All repellents must be registered with the EPA according to the FIFRA along with being registered for use in the Commonwealth. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally recognized as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents are applied according to label requirements, no adverse affects to human safety are expected.

Large rodent damage management programs which include the use of pesticides as a lethal damage management component may have the greatest potential for cumulative impacts on the environment as

such impacts relate to the deposit of chemical residues in the physical environment with potential for environmental toxicosis.

ZP, AP and gas cartridges may be used by WS or recommended by WS for use to manage damage or threats associated with large rodents in the Commonwealth. ZP, AP and gas cartridges have been evaluated for possible residual effects which might occur from buildup of chemicals in soil, water, or other environmental sites. ZP is formulated on baits and placed in areas only after pre-baiting has occurred and in only those areas where non-targets are not present or would not be exposed to treated baits. All uneaten bait is recovered and disposed of according to EPA label requirements. AP and gas cartridges are used in burrows where non-targets are not present of do not have access.

ZP and AP exhibit a low persistence in soil and water, and these chemicals do not bioaccumulate (USDA 1997). Sodium nitrite, the active ingredient in gas cartridges is highly soluble in water, however, when ignited for use is completely converted into gasses that do not accumulate in soil or water. Additionally, EPA levels of sodium nitrite allowed in ground water are relatively high and levels in ground water would not likely be significantly impacted by use of gas cartridges (EPA 1986*a*, EPA 1986*b*). Based on potential use patterns, the chemical and physical characteristics of ZP, AP and gas cartridges and factors related to the environmental fate, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS program in Massachusetts.

WS has received no reports or documented any adverse affects to human safety from WS' large rodent damage management activities conducted from FY 1996 through FY 2011. No cumulative adverse affects from the use of those methods discussed in Appendix B are expected given the use patterns of those methods for resolving large rodent damage in the Commonwealth.

Issue 4 - Effects on Socio-Cultural and Economics of the Human Environment

The activities of WS would result in the removal of large rodents from those areas where damage or threats were occurring. Therefore, the aesthetic value of large rodents in those areas where damage management activities were being conducted would be reduced. However, for some people, the aesthetic value of a more natural environment would be gained by reducing large rodent densities.

Some people experience a decrease in aesthetic enjoyment of wildlife because they feel that overabundant species are objectionable and interfere with their enjoyment of wildlife in general. Continued increases in numbers of individuals or the continued presence of large rodents may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS could positively affect the aesthetic enjoyment of wildlife for those people that are being adversely affected by the target species identified in this EA.

Large rodent population objectives are established and enforced by the MDFW. Therefore, WS has no direct impact on the status of the large rodent population since all take by WS occurs at the discretion of the MDFW. Since those persons seeking assistance could remove large rodents from areas where damage is occurring with, and in some cases without, a permit from the MDFW or a local BOH, WS' involvement would have no effect of the aesthetic value of large rodents in the area where damage was occurring if those large rodents are removed by the resource owner. When damage caused by large rodents has occurred, any removal of large rodents by the property or resource owner would likely occur whether WS was involved with taking the large rodents or not.

Therefore, the activities of WS are not expected to have any cumulative adverse affects on this element of the human environment if occurring at the request of a property owner and/or manager.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Available

WS continues to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing humane methods.

All methods not requiring direct supervision during employment (*e.g.*, live traps) would be checked and monitored to ensure any wildlife confined or restrained are addressed in a timely manner to minimize distress of the animal. All euthanasia methods used for live-captured large rodents would be applied according to AVMA guidelines for free-ranging wildlife, with the possible exception of potentially rabies positive individuals requiring testing. Shooting would occur in limited situations and personnel would be trained in the proper use of firearms to minimize pain and suffering of large rodents taken by this method.

WS employs methods as humanely as possible by applying measures to minimize pain and that allow wildlife captured to be addressed in a timely manner to minimize distress. Through the establishment of SOPs that guide WS in the use of methods to address damage and threats associated with large rodents in the Commonwealth, the cumulative impacts on the issue of method humaneness are minimal. All methods would be evaluated to ensure SOPs are adequate to ensure those methods continue to be used to minimize suffering and that wildlife captured are addressed in a timely manner to minimize distress.

Issue 6 - Effects of Beaver and Muskrat Damage Management on Wetlands

Beaver build dams primarily in smaller riverine wetlands (intermittent and perennial brooks, streams and small rivers) with dams consisting of mud, sticks and other vegetative materials. Their dams obstruct the normal flow of water and typically change the pre-existing wetlands' hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment. The depth of bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

The pre-existing habitat and the altered habitat have different ecological values to the fish and wildlife native to an area. Some species would abound by the addition of a beaver dam, while others will diminish. For example, some fish species require fast moving waters over gravel or cobble beds which beaver dams can eliminate, thus reducing the habitats value for these species. In general, it has been found that wildlife habitat values decline around bottomland beaver impoundments because trees are killed from flooding and mast production declines. On the other hand, beaver dams can potentially be beneficial to some species of fish and wildlife such as river otter, Neotropical birds, and waterfowl.

If a beaver dam is not breached and water is allowed to stand, hydric soils and hydrophytic vegetation eventually form. This process can take anywhere from several months to years depending on pre-existing conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. If these conditions are met, then a wetland has developed that would have different wildlife habitat values than an area that has been more recently impounded by beaver dam activity.

The intent of most dam breaching is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities that WS receives involve dam breaching to return an area back to its pre-existing condition within a few years after the dam was created. If the area does not have hydric soils, it usually takes many years for them to develop and a wetland to become established. This

often takes greater than 5 years as recognized by the Swampbuster provisions. Most beaver dam removal by WS is either exempt from regulation under Section 404 of the Clean Water Act (CWA) as stated in 33 CFR part 323 or may be authorized under the USACE Nationwide Permit System in 33 CFR part 330. However, the breaching of some beaver dams can trigger certain portions of Section 404 that require landowners to obtain permits from the USACE. WS personnel determine the proper course of action upon inspecting a beaver dam impoundment.

It should also be noted that beaver created wetlands are dynamic and do not remain in one state for indefinite periods. Large beaver ponds may eventually fill with sediment and create a beaver meadow. Beaver may be removed from an area due to natural predation or they may abandon an area due to lack of food. Once a dam is abandoned, it is subject to natural decay and damage due to weather. The dam would eventually fail and the wetland would return to a flowing stream or brook. WS' beaver management activities may accelerate or modify these natural processes by removing beaver, restoring or increasing water flow, however they are generally processes that would occur naturally over time.

Muskrat management would usually be intended to maintain or protect existing wetlands by reducing threats to natural and man-made wetlands and associated floral, faunal and T&E communities. Wetlands are often created by natural or man-made dams, dikes, levees and berms that contain standing water or control drainage, particularly after precipitation events that could result in flooding. Muskrat burrowing activity can degrade the integrity of these structures by allowing water infiltration or by causing erosion by feeding on vegetation intended to stabilize dirt structures. Muskrats are omnivores and feed on a variety of aquatic and terrestrial plants and aquatic animals. At high population densities, they may disrupt or damage natural wetland floral and faunal communities or they may feed on T&E species. WS activities would be intended to protect existing wetlands from damage caused by muskrats.

Therefore, the activities of WS to manage beaver and muskrat are not expected to have any cumulative adverse affects on wetlands in Massachusetts if occurring at the request of a property owner and/or manager.

CHAPTER 5: LIST OF PREPARERS, CONSULTANTS, AND REVIEWERS

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APPENDIX A
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APPENDIX B
LARGE RODENT DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE MASSACHUSETTS WS PROGRAM

Large Rodent Damage Management Methods

Resource owners and government agencies have used a variety of techniques to reduce large rodent damage. However, all lethal and non-lethal methods developed to date have limitations based on costs, logistics, or effectiveness. Below is a discussion of methods that would be available to the WS program in Massachusetts to manage damage and threats of damage associated with large rodents. Further discussion and the application of many of the methods available are further discussed in WS' programmatic FEIS (USDA 1997).

Non-chemical Wildlife Damage Management Methods

Non-chemical management methods consist primarily of tools or devices used to exclude, live-capture, or kill a particular animal or local population of wildlife to alleviate resource damage. Methods may be non-lethal (*e.g.*, fencing, frightening devices) or lethal (*e.g.*, firearms, conibear traps). If WS' personnel apply those methods, a *Work Initiation Document for Wildlife Damage Management* (WS Form 12A), *Work Initiation Document for Wildlife Damage Management (Multiple Resource Owners)* (WS Form 12B) or *Work Initiation Document for Management of Wildlife Damage on Urban Properties* (WS Form 12C) must be signed by the landowner or administrator authorizing the use of each damage management method. Non-chemical methods that would be available to WS include:

Exclusion pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals which cannot climb from entering areas of protected resources. Fencing of culverts, drain pipes, and other water control structures can sometimes prevent beaver from building dams which plug those devices. In those applications, however, consideration must be given for water flow so that the fence does not act to catch and hold water-borne debris. Fencing, especially if it is installed with an underground skirt, can prevent access to areas for many mammal species that dig, including woodchucks, beaver and muskrat. Areas such as airports, yards or hay meadows may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent girdling and gnawing of valuable trees and to prevent the entry of large rodents into buildings through existing holes or gaps. Construction of concrete spillways may reduce or prevent damage to dams by burrowing aquatic rodent species. Riprap can also be used on dams or levies at times, especially to deter muskrat, woodchucks, and other burrowing rodents. Electrical water barriers have proven effective in limited situations for beaver; an electrical field through the water in a ditch or other narrow channel, or hot-wire suspended just above the water level in areas protected from public access, have been effective at keeping beaver out. The effectiveness of an electrical barrier is extended when used in conjunction with an odor or taste cue that is emitted because beaver would avoid the area even if the electrical field is discontinued (Kolz and Johnson 1997). Similarly, electric fences of various constructions have been used effectively to reduce damage to various crops (Boggess 1994, Craven and Hygnstrom 1994).

Cultural Methods and Habitat Management includes the application of practices which seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs. Strategies may also include minimizing cover where damaging mammals might hide, manipulating the surrounding environment through barriers or fences to deter animals from entering a protected area, removing trees along stream banks to discourage the presence of beaver, or planting lure crops on fringes of protected crops. Continual destruction of beaver dams and removal of dam construction

materials on a daily basis would sometimes cause beaver to move to other locations, although this strategy can be far more expensive than removing beaver in conjunction with dam removal. Water control devices such as the 3-log drain (Roblee 1983), the T-culvert guard (Roblee 1987), wire mesh culvert (Roblee 1983), and the Clemson beaver pond leveler (Miller and Yarrow 1994) can sometimes be used to control the water in beaver ponds to desirable levels that do not cause damage. Such methods have variable results and rarely provide acceptable levels of control unless used in an integrated program with other strategies.

Removal of overhanging branches and trees from around buildings can sometimes reduce damage associated porcupines accessing structures. Similarly, removing trees from around buildings, fences, roadways and other structures near water may reduce damage associated with beaver felling of trees.

Some large rodents that cause damage in urban environments are attracted to homes by the presence of lush lawns, landscaping shrubs and trees, vegetable and flower gardens and items coated with salt left outside and unprotected. If beaver, muskrat, porcupines or woodchucks are damaging property or causing a nuisance, care in choosing plantings unattractive for feeding, use of fencing and repellents and cleaning or proper storage of items coated with salt can often greatly reduce their presence.

Removal of Beaver Dams That Cause Flooding Damage is generally conducted to maintain existing stream channels and drainage patterns, and reduce flood waters that have affected established silviculture, agriculture, and ranching activities or drainage structures such as culverts. Beaver dams are made from natural debris such as logs, sticks, and mud that beaver take from the immediate area. It is this portion that is dislodged during a beaver dam removal operation. The impoundments that WS removes are normally from recent beaver activity and have not been in place long enough to take on the qualities of a true wetland (*i.e*., hydric soils, aquatic vegetation, preexisting function). Unwanted beaver dams can be removed by hand with a rake or power tools (*e.g*., a winch), or with explosives. Explosives are not currently used for removing beaver dams in Massachusetts, but could potentially be utilized by WS' personnel specially trained and certified to conduct such activities. WS's personnel would only utilize binary explosives (*i.e*., they are comprised of two parts that must be mixed at the site before they can be detonated as an explosive material) for beaver dam removal. Beaver dam removal by hand or with binary explosives does not affect the substrate or the natural course of the stream and returns the area back to its pre-existing condition with similar flows and circulations. Because beaver dams involve waters of the United States, removal is regulated under Section 404 of the Clean Water Act. Beaver dam removal is also regulated by the Massachusetts Wetland Protection Act and the Massachusetts Endangered Species Act.

Wetlands are recognized by three characteristics: hydric soils, hydrophytic vegetation, and general hydrology. Hydric soils are either composed of, or have a thick surface layer of, decomposed plant materials (muck); sandy soils have dark stains or streaks from organic material in the upper layer where plant material has attached to soil particles. In addition, hydric soils may be bluish gray or gray below the surface or brownish black to black and have the smell of rotten eggs. Wetlands also have hydrophytic vegetation present such as cattails, bulrushes, willows, sedges, and water plantains. The final indicator is general hydrology which includes standing and flowing water or waterlogged soils during the growing season; high water marks are present on trees and drift lines of small piles of debris are usually present. Beaver dams usually develop a layer of organic material at the surface because siltation can occur rapidly, but aquatic vegetation and high water marks (a new high water mark is created by the beaver dam) are usually not present. However, cattails and willows can show up rapidly if they are in the vicinity, but most hydrophytic vegetation takes time to establish.

When a dam is removed, debris is discharged into the water. The debris that ends up in the water is considered "*incidental fallback*" or discharge fill. However, in most beaver dam removal operations,

the material that is displaced., if considered to be discharge, is exempt from permit requirements under 33 CFR 323 or 330. A permit would be required if the impoundment caused by a beaver dam was considered a true wetland. WS' personnel survey the beaver dam site and impoundment and determine whether conditions exist suggesting that the area may be a wetland as defined above. If such conditions exist, the landowner is asked the age of the dam or how long he/she has known of its presence to determine whether Swampbuster, Section 404 permit exemptions or NWPs allow removal of the dam. If not, the landowner is required to obtain a Section 404 permit before the dam would be removed by WS' personnel.

The following information explains Section 404 exemptions and conditions that pertain to the removal of beaver dams.

33 CFR 323 - Permits For Discharges of Dredged or Fill Material into Waters of the United States. This regulation provides guidance to determine whether certain activities require permits under Section 404.

Part 323.4 Discharges not requiring permits. This section establishes exemptions for discharging certain types of fill into waters of the U.S. without a permit.

Certain minor drainage activities connected with normal farming, ranching, and silviculture activities where they have been established do not require a permit as long as those drainages do not include the immediate or gradual conversion of a wetland (*i.e.*, beaver ponds greater than 5 years old) to a non-wetland. Specifically part (a)(1)(iii)(C)(i) states, "*...fill material incidental to connecting upland drainage facilities* [*e.g.*, drainage ditches] *to waters of the United States, adequate to effect the removal of excess soil moisture from upland croplands*...". This indicates that beaver dams that block ditches, canals, or other structures designed to drain water from upland crop fields can be removed without a permit.

Moreover, (a)(1)(iii)(C)(iv) states the following types of activities do not require a permit "*The discharges of dredged or fill materials incidental to the emergency removal of sandbars, gravel bars, or other similar blockages which are formed during flood flows or other events, where such blockages close or constrict previously existing drainage ways and, if not promptly removed., would result in damage to or loss of existing crops or would impair or prevent the plowing, seeding, harvesting or cultivating of crops on land in established use for crop production. Such removal does not include enlarging or extending the dimensions of, or changing the bottom elevations of, the affected drainage way as it existed prior to the formation of the blockage. Removal must be accomplished within one year of discovery of such blockages in order to be eligible for exemption*". This allows the removal of beaver dams in natural streams to restore drainage of agricultural lands within one year of discovery.

Part 323.4 (a)(2) allows "*Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption*". This allows beaver dams to be removed without a permit where they have resulted in damage to roads, culverts, bridges, or levees if it is done in a reasonable amount of time.

33 CFR 330 - NWP Program. The Corps Chief of Engineers is authorized to grant certain dredge and fill activities on a nationwide basis if they have minimal impact on the environment. The NWPs are listed in Appendix A of 33 CFR 330 and permittees must satisfy all terms and conditions established in order to qualify for their use. Individual beaver dam removal activities by WS may be covered by any of the following NWPs if not already exempted from permit requirements by the regulations discussed above. WS complies with all conditions and restrictions placed on NWPs for any instance of beaver dam removal done under a specific NWP.

The USACE reevaluated its NWP during 2001-02 and presented revised guidelines in 2002 (USACE 2002). Based on those guidelines, NWPs can be used except in any component of the National Wild and Scenic River System (16 U.S.C. §§ 1271 -1287 as amended) such as the designated reaches of the Red River in Wolfe County, Massachusetts, and any other rivers or reaches and their corridors in Massachusetts which have been designated as part of the Wild Rivers system authorized by The Massachusetts Wild Rivers Act and administered by 401 KAR 4:125 with statutory authority under KRS 146.270. Any beaver dam removal in those designated areas which might be contemplated by WS may require consultation with the USACE and Massachusetts Division of Water to obtain permits for any such activities.

Local municipal Conservation Commissions regulates beaver dam removal and/or installation of flow control devices. Review of the area where dam removal or flow control device installation is required pursuant to MWPA and MESA. If a project area is determined to be within Estimated Habitats of Rare Wildlife based on town maps prepared by the NHESP, WS would consult the NHESP and the local Conservation Commission. A NOI would be prepared and provided to the NHESP, no later than the date of filing of the NOI with the applicable Conservation Commission, for review. WS would also need to file under MESA, unless a project qualifies for a MESA exemption. If a project is exempt from MESA review, a copy of the NOI would still be provided to the NHESP. NHESP may request that WS or the cooperator survey for rare species following standard protocols.

As specified in the MWPA Regulations, (310 CMR 10.37, 10.58(4)(b), and 10.59), the NHESP would respond within 30 days of receipt of a complete NOI filing. The response letter to the local Conservation Commission would provide a determination of whether or not the area to be altered by a proposed project is actual wetland Resource Area habitat for a state-listed rare wildlife species. The NHESP would also determine whether the proposed project would have an adverse effect on the actual habitat of rare wildlife. The NHESP response letter may contain conditions that must be adhered to in order to avoid an adverse effect to rare species habitat, or recommendations for revising the project prior to resubmission. The Conservation Commission may not issue an Order of Conditions for a project in Estimated Habitat until the NHESP has provided a determination letter. According to the regulations, the Conservation Commission shall presume the opinion of the NHESP to be correct. If the NHESP requires conditions or project modifications in order to prevent an "adverse effect," then these conditions must be included in the Order of Conditions. In such cases, a copy of the Order of Conditions must be mailed to the NHESP upon issuance.

> On Federal lands, including Corps and USFWS, wetland restoration can take place without any contract or notification. This NWP "*...applies to restoration projects that serve the purpose of restoring "natural" wetland hydrology, vegetation, and function to altered and degraded non-tidal wetlands and "natural" functions of riparian areas. This NWP does not authorize the conversion of natural wetlands to another aquatic use...*" If operating under this permit, the removal of a beaver dam would be allowed as long as it was not a true wetland (*i.e.*, 5 or more years old), and for non-federal public and private

lands the appropriate agreement, project documentation, or notification is in place.

A quick response without delays resulting from permitting requirements can be critical to the success of minimizing or preventing damage. Exemptions contained in the above regulations or NWPs provide for the removal of the majority of beaver dams that WS in Massachusetts encounters. The primary determination that must be made by WS' personnel is whether a beaver impounded area has become a true wetland or is just a flooded area. The flexibility allowed by those exemptions and NWPs is important for the efficient and effective resolution of many beaver damage problems because damage escalates rapidly in many cases the longer an area remains flooded.

Lure crops/alternate foods are crops planted or other food resources provided to mitigate the potential loss of higher value crops.

Animal behavior modification refers to tactics that deter or repel damaging mammals and thus, reduce damage to the protected resource. These techniques are usually aimed at causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli. Unfortunately, many of those techniques are only effective for a short time before wildlife habituate to them (Conover 1982). Devices used to modify behavior in mammals include electronic guards (siren strobe-light devices), propane exploders, pyrotechnics, laser lights, human effigies, and the noise associated with the discharge of a firearm.

Live Capture and Translocation can be accomplished through the use of hand capture, hand nets, catch poles, cage traps, suitcase type traps or with snares and foothold traps on federal lands to capture some large rodents for the purpose of translocating them for release to wild sites. WS sometimes uses those methods in Massachusetts when the target animal(s) can legally be translocated or can be captured and handled with relative safety by WS' personnel. Live capture and handling of large rodents poses an additional level of human health and safety threat if target animals are aggressive, large, or extremely sensitive to the close proximity of humans. For that reason, WS may limit this method to specific situations and certain species. Excessive populations may make this a poor wildlife management strategy for most species and Massachusetts law restricts translocation to the same property where the animal was live captured. In addition, moving damage-causing individuals to other locations can typically result in damage at the new location, or the translocated individuals can move from the relocation site to areas where they are unwanted. The AVMA, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission (CDC 1990). Although translocation is not necessarily precluded in all cases, it would in most cases be logistically impractical and biologically unwise in Massachusetts, and is evaluated by WS on a case-by-case basis and would only occur with the prior authorization of the MDFW unless conducted on the same property where the animal was captured.

Trapping can utilize a number of devices, including cage type traps, suitcase type traps, conibear (body gripping) traps typically permissible for use in Massachusetts and foothold traps, colony traps, foot snares and neck/body snares considered banned for use in Massachusetts. For a description of those methods the reader is referred to WS' programmatic FEIS (USDA 1997). These techniques are usually implemented by WS' personnel because of the technical training required to use such devices. A formal risk assessment of all mechanical devices that could be used by WS in Massachusetts to manage large rodents can be found in WS' programmatic FEIS (USDA 1997). Below is a brief summary of trap usage.

Cage traps, also known as box traps, are live capture traps used to trap a variety of small-to-medium-sized mammals. Cage traps come in a variety of sizes, are made of galvanized wire mesh, plastic or sheet metal, and consist of a treadle in the middle or rear of the cage that triggers the door to close behind the animal being trapped.

Hancock/Bailey Traps (suitcase/basket type cage traps) are designed to live-capture beaver. The trap is constructed of a metal frame that is hinged with springs attached and covered with chain-link fence. The trap's appearance is similar to a large clam when closed. When set, the trap is opened to allow an animal to enter the *clam shells*, when tripped the *clam shells* close around the animal. One advantage of using the Hancock or Bailey trap is the ease of release of beaver or non-target animals. Beaver caught in Hancock or Bailey traps could also be humanely euthanized. Disadvantages are that those traps are very expensive (>$300 per trap), cumbersome, and difficult to set (Miller and Yarrow 1994). The trap weighs about 25 pounds and is relatively bulky to carry and maneuver. Hancock and Bailey traps can also be dangerous to set (*i.e.*, hardhats are recommended when setting suitcase traps), are less cost and time-efficient than snares, footholds, or body-grip traps, and may cause serious and debilitating injury to river otters (Blundell et al. 1999).

Body-grip (*e.g.*, Conibear-type) Traps are designed to cause the quick death of the animal that activates the trap. The size 330 conibear trap is generally used for beaver exclusively in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface. The size 110 conibear is generally used for muskrats in aquatic habitats. Placement is in travel ways or at lodge or burrow entrances created or used by the target species. The animal captured as it travels through the trap and activates the triggering mechanism. Safety hazards and risks to humans are usually related to setting, placing, checking, or removing the traps. Body-grip traps present a minor risk to non-target animals because of the placement in aquatic habitats and below the water surface. Size 110 to 220 conibear traps could be set over burrow entrances to remove woodchucks and porcupines and size 220 conibear traps could be set in trees for porcupines. Terrestrial sets for conibear traps are currently banned in Massachusetts and would only be used on federal lands at the request of the resource manager.

Foothold Traps can be effectively used to capture a variety of mammals. Foothold traps are either placed beside, or in some situations, in travel ways being actively used by the target species. Placement of traps is contingent upon the habits of the respective target species, habitat conditions, and presence of non-target animals. Effective trap placement and adjustment and the use and placement of appropriate baits and lures by trained WS' personnel also contribute to the foothold trap's selectivity. An additional advantage is that foothold traps can allow for the on-site release of non-target animals. The use of foothold traps requires more skill than some methods, but they are indispensable in resolving many damage problems. They may also be used for drowning sets used to take beaver and muskrat. Foothold traps are currently banned in Massachusetts and would only be used on federal lands at the request of the resource manager.

Colony Traps are essentially cage traps with a repeating one way door that are placed beneath the surface of the water in muskrat travel corridors. Muskrats enter the colony trap through the one way door and cannot exit. Because the trap is completely submerged, death is caused by drowning. These traps can be highly efficient at removing large numbers of muskrats. Colony traps are currently banned in Massachusetts and would only be used on federal lands at the request of the resource manager.

Snares are capture devices comprised of a cable formed in a loop with a locking device and placed in travel ways. Most snares are also equipped with a swivel to minimize cable twisting and breakage. Snares are also easier than foothold traps to keep operational during periods of inclement weather. Snares set to catch an animal around the body or legs are usually a live-capture method. Snares are currently banned in Massachusetts and would only be used on federal lands at the request of the resource manager.

Shooting is selective for target species and may involve the use of spotlights and either a handgun, air rifle, rifle or shotgun. Shooting is an effective method to remove a small number of mammals in damage situations, especially where trapping is not feasible. Removal of specific animals in the problem area can sometimes provide immediate relief from a problem. Shooting is sometimes utilized as one of the first lethal damage management options because it offers the potential of resolving a problem more quickly and selectively than some other methods, but it is not always effective. Shooting may sometimes be one of the only damage management options available if other factors preclude setting of damage management equipment. WS' personnel receive firearms safety training to use firearms that are necessary for performing their duties.

Hunting/Trapping: WS sometimes recommends that resource owners consider legal hunting and trapping as an option for reducing large rodent damage. Although legal hunting/trapping is impractical and/or prohibited in many urban-suburban areas, it can be used to reduce some populations of large rodents.

Chemical Wildlife Damage Management Methods

All pesticides used by WS are registered under the FIFRA and administered by the EPA and MDAR. All WS' personnel in Massachusetts who would apply restricted use pesticides would be certified pesticide applicators by the MDAR and have specific training by WS. The EPA and the MDAR require pesticide applicators to adhere to all certification requirements set forth in the FIFRA. No chemicals would be used by WS on public or private lands without authorization from the land management agency or property owner or manager. The following chemical methods have been proven to be selective and effective in reducing damage by mammals for which each pesticide is registered for use. Specifics related to those chemicals and a summary of their use in Massachusetts is provided below.

Zinc phosphide (ZP) is a rodenticide which is registered as a Restricted Use Pesticide (RUP) because of its hazard to non-target organisms and its acute oral toxicity. RUPs may be purchased and used only by certified applicators. Some formulations of this rodenticide are classified as highly toxic and require the Signal Word DANGER - POISON on the label. Others are either moderately toxic or only slightly toxic, and thus require the Signal Words WARNING or CAUTION, respectively. Trade names for commercial products containing ZP include Arrex, Commando, Denkarin Grains, Gopha-Rid, Phosvin, Pollux, Ridall, Ratol, Rodenticide AG, Zinc-Tox and ZP. Currently Zinc Phosphide Concentrate for Rodent and Lagomorph Control is the only product with ZP as the active ingredient registered for use on large rodents in Massachusetts.

ZP is an inorganic compound that is used to control rats, mice, voles, ground squirrels, prairie dogs, nutria, muskrats, feral rabbits, and gophers. It is also used as a tracking powder for the control of house mice. It is applied to crop areas and non-crop areas including lawns, golf courses, highway medians, and areas adjacent to wetlands. It may be formulated as a grain based bait, as scrap bait, or as a paste. Rodenticide baits usually contain 0.5 to 2.07% ZP, pastes approximately 5 to 10%.

ZP ingested orally reacts with water and acid in the stomach and produces phosphine gas, which may account in a large part for observed toxicity. In rats, the LD_{50} for the technical product (80 to 90% pure) is 40 mg/kg, while the LD_{50} values for lower concentration formulations are slightly higher, indicating lower acute toxicity. In sheep, the LD_{50} ranges from 60 to 70 mg/kg. The compound is nonirritating to the skin and eyes. Rats fed ZP over a wide range of doses experienced toxic effects. Increased liver, brain, and kidney weights, and lesions on those organs, were noted in rats exposed to around 14 mg/kg/day. Body hair loss, reduction in body weight, and reduction of food intake were all noted at 3.5 mg/kg/day. The study was conducted over 13 weeks. There have been no observed symptoms of chronic poisoning due to ZP exposure in humans. However, it has been suggested that

chronic exposure to sub-lethal concentrations for extended periods of time may produce toxic symptoms.

Small amounts of the rodenticide fed to experimental animals may have produced 80% absorption of zinc as well. Zinc in sufficient concentrations may have an emetic effect. Hypophosphite may be excreted in the urine as a metabolite of ZP. There is little tendency for the compound to concentrate in living tissue, as it is readily converted to phosphine.

ZP is highly toxic to wild birds. The most sensitive birds are geese (LD_{50} of 7.5 mg/kg for the white-fronted goose). Pheasants, mourning doves, quail, mallard ducks, and the horned lark are also very susceptible to this compound. Blackbirds are less sensitive.

ZP is highly toxic to freshwater fish. The fish species which have been evaluated include bluegill sunfish (LC_{50} of 0.8 mg/L) and rainbow trout (LC_{50} of 0.5 mg/L) [1]. Carp were also found to be susceptible to ZP, especially in weakly acidic water.

ZP is also toxic to non-target mammals when ingested directly. Nearly 60 studies have been conducted on the toxicity of this rodenticide to wild animals. Secondary toxicity to mammalian predators (animals eating other animals that had been exposed to the compound) from ZP is rather low, primarily because the compound does not significantly accumulate in the muscles of target species. Some of the toxic effects to predators have been due to the ingestion of ZP that was in the digestive tract of the target organism. Studies on secondary organisms have focused on coyotes, fox, mink, weasels, and birds of prey. Under field conditions, most of the toxic effects to non-target wildlife are due to direct exposures resulting from misuse or misapplication of this rodenticide.

ZP would be used in in Massachusetts in accordance with label restrictions in a manner defined by application guidelines on the label. Application procedures and baits used are determined by formulations allowed by labeling and the species targeted. Most ZP applications in Massachusetts are for vole damage management, although some applications for Norway rats and other species are conducted.

Aluminum phosphide is a Restricted Use Pesticide so may be purchased and used only by certified applicators. It is in EPA Toxicity Class I and products containing it must bear the signal word DANGER. AP was first registered for use in the United States in the late 1950s. Current trade or other names include Degesch Photoxin Pellets/Tablets, Detia Phos Pellets/Tablets Fastphos, Fumitoxin, Gastoxin, Max-Kill, Phosfume, Phostoxin and Weevilcide. Al-phos, Celphide, Celphine, Celphos, Detia-Gas-Ex, and Quick Tox may have been used in previous formulations.

AP is an inorganic phosphide used to control insects and rodents in a variety of settings. It is mainly used as an indoor fumigant at crop transport, storage or processing facilities (or in shipholds, railcars) for both food and non-food crops. It may also be used as an outdoor fumigant for burrowing rodent and mole control, or in baits for rodent control in crops. AP is available in pellet and tablet form, and is also available in porous blister packs, sachets or as dusts. As in the case of Phostoxin, it may be formulated as 55% active ingredient along with ammonium carbamate and inert ingredients.

Phostoxin and AP can cause acute toxicity. Neither is absorbed dermally; rather main routes of exposure are through ingestion and inhalation. They are highly toxic via both those routes. The reported rodent oral LD_{50} is 11.5 mg/kg for Phostoxin, with that for the technical compound presumably lower. AP ingested orally reacts with water and stomach acids to produce phosphine gas, which may account in a large part for observed toxicity. Phosphine generated in the gastrointestinal tract is readily absorbed in to the bloodstream, and it is readily absorbed through the lung epithelium.

In chronic toxicity studies, rats fed AP-fumigated chow averaging 0.51 ppm phosphine residues (approximately 0.43 mg/kg/day) showed no differences from the control animals with respect to blood or urine chemistry and no observable differences in tissue structure. It was reported that workers had probably encountered similar exposures on an intermittent basis (in some cases over as long as a 20-year period) and had yet to show signs of toxicity, which suggests that chronic effects may be minor or have a very long latency period. Inhalation studies were conducted on the effects of phosphine gas on male and female rats exposed at levels of 0.5, 1.5, and 4.5 mg/meters cubed for six hours per day over a 13 week period. Higher exposure groups (7.5 and 15 mg/meters cubed) were added following preliminary acute test results.

Results indicated that 15 mg/m^3 were lethal to 4 out of 10 female rats following 3 days of exposure. Significant treatment-related effects on body weight and decreased food consumption were seen across all treatment groups and sexes, but were reversible. Decreases in red-blood cell counts, hemoglobin, hematocrit and increased platelet counts were seen in male rats of the 4.5 mg/m^3 group. Dose-related changes in blood urea nitrogen and other clinical parameters were also seen across exposure groups. Post-mortem examination of test animals revealed microscopic lesions in the outer cortex of the kidneys of rats exposed to 15 mg/m^3, but not at lower exposure levels. All of those effects were apparently reversible following a four-week recovery period.

AP would be used in Massachusetts primarily as a fumigant for woodchuck burrows. It would be used in accordance with label restrictions in a manner defined by application guidelines on the label. Use in Massachusetts is infrequent and amounts used are very small.

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calm fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer. Currently, tiletamine can only be purchased as Telazol, which is a mixture of two drugs: tiletamine and zolazepam (a tranquilizer). Muscle tension varies with species. Telazol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for those wild species (Fowler and Miller 1999). This drug is sold in a powder form and must be reconstituted with sterile water before use. Once mixed with sterile water, the shelf life is four days at room temperature and 14 days if refrigerated.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamine/xylazine combinations, xylazine would usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Fowler and Miller 1999). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point

of respiratory arrest. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS' personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

Gas Cartridges are registered as a fumigant by the EPA (Reg. No. 56228-21) and are used in conjunction with denning operations. When ignited., the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, and tasteless, poisonous gas. The combination of oxygen depletion and carbon monoxide exposure kills the animals in the den. Carbon monoxide euthanasia is recognized by the AVMA as an approved and humane method to kill animals (Beaver et al. 2001).

CO_2 is sometimes used to euthanize mammals which are captured in live traps and when relocation is not a feasible option. Live mammals are placed in a chamber and sealed shut. CO_2 gas is released into the chamber and the animal die quickly after inhaling the gas. This method is approved as a euthanizing agent by the AVMA. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Repellents are usually naturally occurring substances or chemicals formulated to be distasteful or to elicit pain or discomfort for target animals when they are smelled, tasted, or contacted. Only a few repellents are commercially available for large rodents, and are registered for only a few species. Repellents are variably effective and depend to a great extent on resource to be protected, time and length of application, and sensitivity of the species causing damage. Acceptable levels of damage control are usually not realized unless repellents are used in conjunction with other techniques. There are 6 repellent formulations registered in 2011 for use on beaver, 5 for woodchucks, and 3 for porcupines in Massachusetts.

Product Name	Species	EPA Reg. #	Active Ingredients/Chemical Code
Ro-pel Animal and Rodent Repellent	Beaver	81117-1-1663	Thymol (80402), Denatonium saccharide (129045)
Ropel Animal, Rodent and Bird Repellent	Beaver	81117-1	Thymol (80402), Denatonium saccharide (129045)
JT Eaton 4 the Birds Transparent Bird Repellent Liquid	Beaver	8254-3-56	Polybutene (11402)
Bird-B-Gone Transparent Bird Repellent Liquid	Beaver	8254-3-71050	Polybutene (11402)
Shake-Away Coyote Urine Granules	Beaver Woodchuck Porcupine	80917-1	Coyote Urine (29007)
Shake-Away Coyote/Fox Urine Granules	Beaver Woodchuck Porcupine	80917-5	Coyote Urine (29007),
Shake-Away Fox Urine Granules	Woodchuck	80917-4	Fox Urine (29008)

Havahart Critter Ridder Concentrate	Woodchuck	50932-17	Black Pepper Oil (669) Piperidine (43501) Capsaicin (70701)
Havahart Critter Ridder RTU (ready to use)	Woodchuck	50932-16	Black Pepper Oil (669) Piperidine (43501) Capsaicin (70701)
Hot Sauce Animal Repellent	Porcupine	72-574	Capsaicin (70701)

APPENDIX C
FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES IN MASSACHUSETTS

Animal species listed in this state and that occur in this state

Status	Species
E	Beetle, American burying (*Nicrophorus americanus*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Plymouth Red-Bellied Turtle (*Pseudemys rubriventris bangsi*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, blue (*Balaenoptera musculus*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Whale, Sei (*Balaenoptera borealis*)

Animal species listed in this state that do not occur in this state

Status	Species
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
E	Curlew, Eskimo (*Numenius borealis*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Wolf, gray Lower 48 States, except where delisted and where EXPN. Mexico. (*Canis lupus*)

Animal listed species occurring in this state that are not listed in this state

Status	Species
T	Sea turtle, green except where endangered (*Chelonia mydas*)

Plant species listed in this state and that occur in this state

Status	Species
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)

Plant species listed in this state that do not occur in this state

Status	Species
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Chaffseed, American (*Schwalbea americana*)

APPENDIX D
SPECIES THAT ARE STATE LISTED AS THREATENED, ENDANGERED, OR OF SPECIAL CONCERN IN THE COMMONWEALTH OF MASSACHUSETTS

Common Name	Scientific Name	MA Status	Fed Status	Notes
VERTEBRATES:				
Fish				
American Brook Lamprey	*Lampetra appendix*	T		
Shortnose Sturgeon	*Acipenser brevirostrum*	E	E	
Atlantic Sturgeon	*Acipenser oxyrinchus*	E		
Lake Chub	*Couesius plumbeus*	E		
Eastern Silvery Minnow	*Hybognathus regius*	SC		
Bridle Shiner	*Notropis bifrenatus*	SC		
Northern Redbelly Dace	*Phoxinus eos*	E		
Longnose Sucker	*Catostomus catostomus*	SC		
Burbot	*Lota lota*	SC		
Threespine Stickleback	*Gasterosteus aculeatus*	T		1
Amphibians				
Jefferson Salamander	*Ambystoma jeffersonianum*	SC		2
Blue-Spotted Salamander	*Ambystoma laterale*	SC		3
Marbled Salamander	*Ambystoma opacum*	T		
Eastern Spadefoot	*Scaphiopus holbrookii*	T		
Reptiles				
Loggerhead Seaturtle	*Caretta caretta*	T	T	
Green Seaturtle	*Chelonia mydas*	T	T	
Hawksbill Seaturtle	*Eretmochelys imbricata*	E	E	
Kemp's Ridley Seaturtle	*Lepidochelys kempii*	E	E	
Leatherback Seaturtle	*Dermochelys coriacea*	E	E	
Wood Turtle	*Glyptemys insculpta*	SC		
Bog Turtle	*Glyptemys muhlenbergii*	E	T	
Blanding's Turtle	*Emydoidea blandingii*	T		
Diamond-backed Terrapin	*Malaclemys terrapin*	T		
Northern Red-bellied Cooter	*Pseudemys rubriventris*	E	E	4
Eastern Box Turtle	*Terrapene carolina*	SC		
Eastern Wormsnake	*Carphophis amoenus*	T		
Eastern Ratsnake	*Pantherophis alleghaniensis*	E		
Copperhead	*Agkistrodon contortrix*	E		
Timber Rattlesnake	*Crotalus horridus*	E		
Birds				
Common Loon	*Gavia immer*	SC		
Pied-Billed Grebe	*Podilymbus podiceps*	E		
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	E		
American Bittern	*Botaurus lentiginosus*	E		
Least Bittern	*Ixobrychus exilis*	E		
Bald Eagle	*Haliaeetus leucocephalus*	E		
Northern Harrier	*Circus cyaneus*	T		
Sharp-Shinned Hawk	*Accipiter striatus*	SC		

Peregrine Falcon	*Falco peregrinus*	E		
King Rail	*Rallus elegans*	T		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Common Moorhen	*Gallinula chloropus*	SC		
Piping Plover	*Charadrius melodus*	T	T	
Upland Sandpiper	*Bartramia longicauda*	E		
Roseate Tern	*Sterna dougallii*	E	E	
Common Tern	*Sterna hirundo*	SC		
Arctic Tern	*Sterna paradisaea*	SC		
Least Tern	*Sternula antillarum*	SC		
Barn Owl	*Tyto alba*	SC		
Long-Eared Owl	*Asio otus*	SC		
Short-Eared Owl	*Asio flammeus*	E		
Sedge Wren	*Cistothorus platensis*	E		
Golden-Winged Warbler	*Vermivora chrysoptera*	E		
Northern Parula	*Parula americana*	T		
Blackpoll Warbler	*Dendroica striata*	SC		
Mourning Warbler	*Oporornis philadelphia*	SC		
Vesper Sparrow	*Pooecetes gramineus*	T		
Grasshopper Sparrow	*Ammodramus savannarum*	T		
Henslow's Sparrow	*Ammodramus henslowii*	E		
Mammals				
Water Shrew	*Sorex palustris*	SC		
Rock Shrew	*Sorex dispar*	SC		
Indiana Myotis	*Myotis sodalis*	E	E	
Small-Footed Myotis	*Myotis leibii*	SC		
Southern Bog Lemming	*Synaptomys cooperi*	SC		
Sperm Whale	*Physeter catodon*	E	E	
Fin Whale	*Balaenoptera physalus*	E	E	
Sei Whale	*Balaenoptera borealis*	E	E	
Blue Whale	*Balaenoptera musculus*	E	E	
Humpback Whale	*Megaptera novaeangliae*	E	E	
Northern Right Whale	Eubalaena glacialis	E	E	

INVERTEBRATES:

Sponges				
Smooth Branched Sponge	*Spongilla aspinosa*	SC		
Flatworms				
Sunderland Spring Planarian	*Polycelis remota*	E		
Segmented Worms				
New England Medicinal Leech	*Macrobdella sestertia*	SC		
Snails				
New England Siltsnail	*Floridobia winkleyi*	SC		
Walker's Limpet	*Ferrissia walkeri*	SC		
Coastal Marsh Snail	*Littoridinops tenuipes*	SC		
Slender Walker	*Pomatiopsis lapidaria*	E		
Boreal Marstonia	*Marstonia lustrica*	E		

Boreal Turret Snail	*Valvata sincera*	E		
Mussels				
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	E	
Triangle Floater	*Alasmidonta undulata*	SC		
Swollen Wedgemussel	*Alasmidonta varicosa*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Yellow Lampmussel	*Lampsilis cariosa*	E		
Tidewater Mucket	*Leptodea ochracea*	SC		
Eastern Pondmussel	*Ligumia nasuta*	SC		
Creeper	*Strophitus undulatus*	SC		
Crustaceans				
Intricate Fairy Shrimp	*Eubranchipus intricatus*	SC		
Agassiz's Clam Shrimp	*Eulimnadia agassizii*	E		
Northern Spring Amphipod	*Gammarus pseudolimnaeus*	SC		
American Clam Shrimp	*Limnadia lenticularis*	SC		
Taconic Cave Amphipod	*Stygobromus borealis*	E		
Piedmont Groundwater Amphipod	*Stygobromus tenuis tenuis*	SC		
Coastal Swamp Amphipod	*Synurella chamberlaini*	SC		
Insects				
Dragonflies				
Spatterdock Darner	*Rhionaeschna mutata*	SC		
Subarctic Darner	*Aeshna subarctica*	T		
Comet Darner	*Anax longipes*	SC		
Ocellated Darner	*Boyeria grafiana*	SC		
Spine-Crowned Clubtail	*Gomphus abbreviatus*	E		
Harpoon Clubtail	*Gomphus descriptus*	E		
Midland Clubtail	*Gomphus fraternus*	E		
Rapids Clubtail	*Gomphus quadricolor*	T		
Cobra Clubtail	*Gomphus vastus*	SC		
Skillet Clubtail	*Gomphus ventricosus*	SC		
Umber Shadowdragon	*Neurocordulia obsoleta*	SC		
Stygian Shadowdragon	*Neurocordulia yamaskanensis*	SC		
Brook Snaketail	*Ophiogomphus aspersus*	SC		
Riffle Snaketail	*Ophiogomphus carolus*	T		
Ski-tipped Emerald	*Somatochlora elongata*	SC		
Forcipate Emerald	*Somatochlora forcipata*	SC		
Coppery Emerald	*Somatochlora georgiana*	E		
Incurvate Emerald	*Somatochlora incurvata*	T		
Kennedy's Emerald	*Somatochlora kennedyi*	E		
Mocha Emerald	*Somatochlora linearis*	SC		
Riverine Clubtail	*Stylurus amnicola*	E		
Zebra Clubtail	*Stylurus scudderi*	SC		
Arrow Clubtail	*Stylurus spiniceps*	T		
Ebony Boghaunter	*Williamsonia fletcheri*	E		
Ringed Boghaunter	*Williamsonia lintneri*	E		
Damselflies				

Tule Bluet	*Enallagma carunculatum*	SC		
Attenuated Bluet	*Enallagma daeckii*	SC		
New England Bluet	*Enallagma laterale*	SC		
Scarlet Bluet	*Enallagma pictum*	T		
Pine Barrens Bluet	*Enallagma recurvatum*	T		
Beetles				
Twelve-Spotted Tiger Beetle	*Cicindela duodecimguttata*	SC		
Hentz's Redbelly Tiger Beetle	*Cicindela rufiventris hentzii*	T		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Northeastern Beach Tiger Beetle	*Cicindela dorsalis dorsalis*	E	T	
Bank Tiger Beetle	*Cicindela limbalis*	SC		
Cobblestone Tiger Beetle	*Cicindela marginipennis*	E		
Barrens Tiger Beetle	*Cicindela patruela*	E		
Puritan Tiger Beetle	*Cicindela puritana*	E	T	
Purple Tiger Beetle	*Cicindela purpurea*	SC		
American Burying Beetle	*Nicrophorus americanus*	E	E	
Butterflies and Moths				
Coastal Heathland Cutworm	*Abagrotis nefascia*	SC		
Barrens Daggermoth	*Acronicta albarufa*	T		
Drunk Apamea Moth	*Apamea inebriata*	SC		
New Jersey Tea Inchworm	*Apodrepanulatrix liberaria*	E		
Straight Lined Mallow Moth	*Bagisara rectifascia*	SC		
Hessel's Hairstreak	*Callophrys hesseli*	SC		
Frosted Elfin	*Callophrys irus*	SC		
Bog Elfin	*Callophrys lanoraieensis*	T		
Gerhard's Underwing	*Catocala herodias gerhardi*	SC		
Precious Underwing Moth	*Catocala pretiosa pretiosa*	E		
Waxed Sallow Moth	*Chaetaglaea cerata*	SC		
Melsheimer's Sack Bearer	*Cicinnus melsheimeri*	T		
Chain Dot Geometer	*Cingilia catenaria*	SC		
Unexpected Cycnia	*Cycnia inopinatus*	T		
Three-Lined Angle Moth	*Digrammia eremiata*	T		
Imperial Moth	*Eacles imperialis*	T		
Early Hairstreak	*Erora laeta*	T		
Persius Duskywing	*Erynnis persius persius*	E		
Sandplain Euchlaena	*Euchlaena madusaria*	SC		
Dion Skipper	*Euphyes dion*	T		
The Pink Streak	*Faronta rubripennis*	T		
Phyllira Tiger Moth	*Grammia phyllira*	E		
Slender Clearwing Sphinx Moth	*Hemaris gracilis*	SC		
Barrens Buckmoth	*Hemileuca maia*	SC		
Buchholz's Gray	*Hypomecis buchholzaria*	E		
Pine Barrens Itame	*Itame* sp. 1	SC		5
Pale Green Pinion Moth	*Lithophane viridipallens*	SC		
Twilight Moth	*Lycia rachelae*	E		
Pine Barrens Lycia	*Lycia ypsilon*	T		
Barrens Metarranthis	*Metarranthis apiciaria*	E		

Coastal Swamp Metarranthis	*Metarranthis pilosaria*	SC		
Northern Brocade Moth	*Neoligia semicana*	SC		
Dune Noctuid Moth	*Oncocnemis riparia*	SC		
Pitcher Plant Borer	*Papaipema appassionata*	T		
Ostrich Fern Borer	*Papaipema* sp. 2	.SC		6
Chain Fern Borer	*Papaipema stenocelis*	T		
Water-willow Stem Borer	*Papaipema sulphurata*	T		
Mustard White	*Pieris oleracea*	T		
Pink Sallow Moth	*Psectraglaea carnosa*	SC		
Southern Ptichodis	*Ptichodis bistrigata*	T		
Orange Sallow Moth	*Rhodoecia aurantiago*	T		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Oak Hairstreak	*Satyrium favonius*	SC		
Spartina Borer	*Spartiniphaga inops*	SC		
Faded Gray Geometer	*Stenoporpia polygrammaria*	T		
Pine Barrens Zale	*Zale* sp. 1	SC		7
Pine Barrens Zanclognatha	*Zanclognatha martha*	T		

PLANTS:

Aceraceae (Maples)				
Black Maple	*Acer nigrum*	SC		
Adiantaceae (Cliff Ferns)				
Fragile Rock-Brake	*Cryptogramma stelleri*	E		
Alismataceae (Arrowheads)				
Estuary Arrowhead	*Sagittaria montevidensis* ssp. *spongiosa*	E		
Wapato	*Sagittaria cuneata*	T		
River Arrowhead	*Sagittaria subulata*	E		
Terete Arrowhead	*Sagittaria teres*	SC		
Apiaceae (Parsleys, Angelicas)				
Hemlock Parsley	*Conioselinum chinense*	SC		
Saltpond Pennywort	*Hydrocotyle verticillata*	T		
Canadian Sanicle	*Sanicula canadensis*	T		
Long-Styled Sanicle	*Sanicula odorata*	T		
Aquifoliaceae (Hollies)				
Mountain Winterberry	*Ilex montana*	E		
Araceae (Arums)				
Green Dragon	*Arisaema dracontium*	T		
Golden Club	*Orontium aquaticum*	E		
Araliaceae (Ginsengs)				
Ginseng	*Panax quinquefolius*	SC		
Asclepiadaceae (Milkweeds)				
Purple Milkweed	*Asclepias purpurascens*	E		
Linear-Leaved Milkweed	*Asclepias verticillata*	T		
Aspleniaceae (Spleenworts)				
Mountain Spleenwort	*Asplenium montanum*	E		
Wall-Rue Spleenwort	*Asplenium ruta-muraria*	T		

Asteraceae (Asters, Composites)				
Lesser Snakeroot	*Ageratina aromatica*	E		
Eaton's Beggar-ticks	*Bidens eatonii*	E		
Estuary Beggar-ticks	*Bidens hyperborea*	E		
Cornel-leaved Aster	*Doellingeria infirma*	E		
New England Boneset	*Eupatorium novae-angliae*	E		
Purple Cudweed	*Gamochaeta purpurea*	E		
New England Blazing Star	*Liatris scariosa* var. *novae-angliae*	SC		
Lion's Foot	*Nabalus serpentarius*	E		
Sweet Coltsfoot	*Petasites frigidus* var. *palmatus*	E		
Sclerolepis	*Sclerolepis uniflora*	E		
Large-Leaved Goldenrod	*Solidago macrophylla*	T		
Upland White Aster	*Solidago ptarmicoides*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Rand's Goldenrod	*Solidago simplex* ssp. *randii* v. *monticola*	E		
Eastern Silvery Aster	*Symphyotrichum concolor*	E		
Crooked-Stem Aster	*Symphyotrichum prenanthoides*	T		
Tradescant's Aster	*Symphyotrichum tradescantii*	T		
Betulaceae (Birches, Alders)				
Mountain Alder	*Alnus viridis* ssp. *crispa*	T		
Swamp Birch	*Betula pumila*	E		
Boraginaceae (Borages)				
Oysterleaf	*Mertensia maritima*	E		
Brassicaceae (Mustards)				
Lyre-Leaved Rock-cress	*Arabidopsis lyrata*	E		
Smooth Rock-cress	*Boechera laevigata*	T		
Green Rock-cress	*Boechera missouriensis*	T		
Purple Cress	*Cardamine douglassii*	E		
Long's Bitter-cress	*Cardamine longii*	E		
Fen Cuckoo Flower	*Cardamine pratensis* var. *palustris*	T		
Cactaceae (Cacti)				
Prickly Pear	*Opuntia humifusa*	E		
Campanulaceae (Bluebells, Lobelias)				
Great Blue Lobelia	*Lobelia siphilitica*	E		
Caprifoliaceae (Honeysuckles)				
Hairy Honeysuckle	*Lonicera hirsuta*	E		
Snowberry	*Symphoricarpos albus* var. *albus*	E		
Broad Tinker's-weed	*Triosteum perfoliatum*	E		
Downy Arrowwood	*Viburnum rafinesquianum*	E		
Caryophyllaceae (Pinks, Sandworts)				
Nodding Chickweed	*Cerastium nutans*	E		
Michaux's Sandwort	*Minuartia michauxii*	T		
Large-leaved Sandwort	*Moehringia macrophylla*	E		
Silverling	*Paronychia argyrocoma*	E		
Chenopodiaceae (Saltworts)				

Fogg's Goosefoot	*Chenopodium foggii*	E		
American Sea-blite	*Suaeda calceoliformis*	SC		
Cistaceae (Rockroses, Pinweeds)				
Bushy Rockrose	*Crocanthemum dumosum*	SC		
Beaded Pinweed	*Lechea pulchella* var. *moniliformis*	E		
Clusiaceae (St. John's-worts)				
Creeping St. John's-wort	*Hypericum adpressum*	T		
Giant St. John's-wort	*Hypericum ascyron*	E		
St. Andrew's Cross	*Hypericum hypericoides* ssp. *multicaule*	E		
Convolvulaceae (Morning Glories)				
Low Bindweed	*Calystegia spithamaea*	E		
Crassulaceae (Sedums)				
Pygmyweed	*Tillaea aquatica*	T		
Cupressaceae (Cedars, Junipers)				
Arborvitae	*Thuja occidentalis*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Cyperaceae (Sedges)				
River Bulrush	*Bolboschoenus fluviatilis*	SC		
Foxtail Sedge	*Carex alopecoidea*	T		
Back's Sedge	*Carex backii*	E		
Bailey's Sedge	*Carex baileyi*	T		
Bush's Sedge	*Carex bushii*	E		
Chestnut-colored Sedge	*Carex castanea*	E		
Creeping Sedge	*Carex chordorrhiza*	E		
Davis's Sedge	*Carex davisii*	E		
Glaucescent Sedge	*Carex glaucodea*	E		
Handsome Sedge	*Carex formosa*	T		
Slender Woodland Sedge	*Carex gracilescens*	E		
Gray's Sedge	*Carex grayi*	T		
Hitchcock's Sedge	*Carex hitchcockiana*	SC		
Shore Sedge	*Carex lenticularis*	T		
Glaucous Sedge	*Carex livida*	E		
False Hop Sedge	*Carex lupuliformis*	E		
Midland Sedge	*Carex mesochorea*	E		
Michaux's Sedge	*Carex michauxiana*	E		
Mitchell's Sedge	*Carex mitchelliana*	T		
Few-fruited Sedge	*Carex oligosperma*	E		
Few-flowered Sedge	*Carex pauciflora*	E		
Variable Sedge	*Carex polymorpha*	E		
Schweinitz's Sedge	*Carex schweinitzii*	E		
Dioecious Sedge	*Carex sterilis*	T		
Walter's Sedge	*Carex striata*	E		
Fen Sedge	*Carex tetanica*	SC		
Hairy-fruited Sedge	*Carex trichocarpa*	T		
Tuckerman's Sedge	*Carex tuckermanii*	E		

Cat-tail Sedge	*Carex typhina*	T		
Wiegand's Sedge	*Carex wiegandii*	E		
Engelmann's Umbrella-sedge	*Cyperus engelmannii*	T		
Houghton's Flatsedge	*Cyperus houghtonii*	E		
Wright's Spike-rush	*Eleocharis diandra*	E		
Intermediate Spike-sedge	*Eleocharis intermedia*	T		
Tiny-fruited Spike-rush/Spike-sedge	*Eleocharis microcarpa* var. *filiculmis*	E		
Ovate Spike-rush or Spike-sedge	*Eleocharis ovata*	E		
Few-flowered Spike-sedge	*Eleocharis quinqueflora*	E		
Three-angled Spike-sedge	*Eleocharis tricostata*	E		
Slender Cottongrass	*Eriophorum gracile*	T		
Dwarf Bulrush	*Lipocarpha micrantha*	T		
Capillary Beak-rush or Beak-sedge	*Rhynchospora capillacea*	E		
Inundated Horned-sedge	*Rhynchospora inundata*	T		
Short-beaked Bald-sedge	*Rhynchospora nitens*	T		
Long-beaked Bald-sedge	*Rhynchospora scirpoides*	SC		
Torrey's Beak-sedge	*Rhynchospora torreyana*	E		
Northeastern Bulrush	*Scirpus ancistrochaetus*	E	E	
Long's Bulrush	*Scirpus longii*	T		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Papillose Nut-sedge	*Scleria pauciflora*	E		8
Tall Nut-sedge	*Scleria triglomerata*	E		
Dryopteridaceae (Wood Ferns)				
Braun's Holly-fern	*Polystichum braunii*	E		
Smooth Woodsia	*Woodsia glabella*	E		
Elatinaceae (Waterworts)				
American Waterwort	*Elatine americana*	E		
Empetraceae (Crowberries)				
Broom Crowberry	*Corema conradii*	SC		
Equisetaceae (Horsetails)				
Dwarf Scouring-rush	*Equisetum scirpoides*	SC		
Ericaceae (Laurels, Blueberries)				
Great Laurel	*Rhododendron maximum*	T		
Mountain Cranberry	*Vaccinium vitis-idaea* ssp. *minus*	E		
Eriocaulaceae (Pipeworts)				
Parker's Pipewort	*Eriocaulon parkeri*	E		
Fabaceae (Beans, Peas, Clovers)				
Large-bracted Tick-trefoil	*Desmodium cuspidatum*	T		
Wild Senna	*Senna hebecarpa*	E		
Fagaceae (Oaks, Beeches)				
Bur Oak	*Quercus macrocarpa*	SC		
Yellow Oak	*Quercus muehlenbergii*	T		
Fumariaceae (Fumitories)				
Climbing Fumitory	*Adlumia fungosa*	SC		

Gentianaceae (Gentians)				
Andrew's Bottle Gentian	*Gentiana andrewsii*	E		
Spurred Gentian	*Halenia deflexa*	E		
Slender Marsh Pink	*Sabatia campanulata*	E		
Plymouth Gentian	*Sabatia kennedyana*	SC		
Sea Pink	*Sabatia stellaris*	E		
Grossulariaceae (Currants)				
Bristly Black Currant	*Ribes lacustre*	SC		
Haemodoraceae (Redroots)				
Redroot	*Lachnanthes caroliana*	SC		
Haloragaceae (Water-milfoils)				
Alternate-flowered Water-milfoil	*Myriophyllum alterniflorum*	E		
Farwell's Water-milfoil	*Myriophyllum farwellii*	E		
Pinnate Water-milfoil	*Myriophyllum pinnatum*	SC		
Comb Water-milfoil	*Myriophyllum verticillatum*	E		
Hydrophyllaceae (Waterleaves)				
Broad Waterleaf	*Hydrophyllum canadense*	E		
Hymenophyllaceae (Filmy-ferns)				
Weft Bristle-fern	*Trichomanes intricatum*	E		
Iridaceae (Irises)				
Sandplain Blue-eyed Grass	*Sisyrinchium fuscatum*	SC		
Slender Blue-eyed Grass	*Sisyrinchium mucronatum*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Isoetaceae (Quillworts)				
Acadian Quillwort	*Isoetes acadiensis*	E		
Lake Quillwort	*Isoetes lacustris*	E		
Juncaceae (Rushes)				
Weak Rush	*Juncus debilis*	E		
Thread Rush	*Juncus filiformis*	E		
Black-fruited Woodrush	*Luzula parviflora* ssp. *melanocarpa*	E		
Lamiaceae (Mints)				
Purple Giant-hyssop	*Agastache scrophulariifolia*	E		
Downy Wood-mint	*Blephilia ciliata*	E		
Hairy Wood-mint	*Blephilia hirsuta*	E		
Gypsywort	*Lycopus rubellus*	E		
False Pennyroyal	*Trichostema brachiatum*	E		
Lentibulariaceae (Bladderworts)				
Resupinate Bladderwort	*Utricularia resupinata*	T		
Subulate Bladderwort	*Utricularia subulata*	SC		
Liliaceae (Lilies)				
Devil's-bit	*Chamaelirium luteum*	E		
Linaceae (Flaxes)				
Sandplain Flax	*Linum intercursum*	SC		
Rigid Flax	*Linum medium* var. *texanum*	T		
Lycopodiaceae (Clubmosses)				

Foxtail Clubmoss	*Lycopodiella alopecuroides*	E		
Mountain Firmoss	*Huperzia selago*	E		
Lythraceae (Loosestrifes)				
Toothcup	*Rotala ramosior*	E		
Magnoliaceae (Magnolias)				
Sweetbay Magnolia	*Magnolia virginiana*	E		
Melastomataceae (Meadow Beauties)				
Maryland Meadow Beauty	*Rhexia mariana*	E		
Moraceae (Mulberries)				
Red Mulberry	*Morus rubra*	E		
Nymphaeaceae (Water Lilies)				
Tiny Cow-lily	*Nuphar microphylla*	E		
Onagraceae (Evening Primroses)				
Many-fruited False-loosestrife	*Ludwigia polycarpa*	E		
Round-fruited False-loosestrife	*Ludwigia sphaerocarpa*	E		
Ophioglossaceae (Grape Ferns)				
Adder's-tongue Fern	*Ophioglossum pusillum*	T		
Orchidaceae (Orchids)				
Putty-root	*Aplectrum hyemale*	E		
Arethusa	*Arethusa bulbosa*	T		
Autumn Coralroot	*Corallorhiza odontorhiza*	SC		
Ram's-head Lady's-slipper	*Cypripedium arietinum*	E		
Small Yellow Lady's-slipper	*Cypripedium parviflorum* var. *makasin*	E		
Showy Lady's-slipper	*Cypripedium reginae*	SC		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Dwarf Rattlesnake-plantain	*Goodyera repens*	E		
Small Whorled Pogonia	*Isotria medeoloides*	E	T	
Lily-leaf Twayblade	*Liparis liliifolia*	T		
Heartleaf Twayblade	*Listera cordata*	E		
Bayard's Green Adder's-mouth	*Malaxis bayardii*	E		
White Adder's-mouth	*Malaxis monophyllos* var. *brachypoda*	E		
Crested Fringed Orchis	*Platanthera cristata*	E		
Leafy White Orchis	*Platanthera dilatata*	T		
Pale Green Orchis	*Platanthera flava* var. *herbiola*	T		
Hooded Ladies'-tresses	*Spiranthes romanzoffiana*	E		
Grass-leaved Ladies'-tresses	*Spiranthes vernalis*	T		
Cranefly Orchid	*Tipularia discolor*	E		
Three Bird Orchid (Nodding Pogonia)	*Triphora trianthophora*	E		
Oxalidaceae (Wood-sorrels)				
Violet Wood-sorrel	*Oxalis violacea*	E		
Poaceae (Grasses)				
Annual Peanutgrass	*Amphicarpum amphicarpon*	E		
Purple Needlegrass	*Aristida purpurascens*	T		

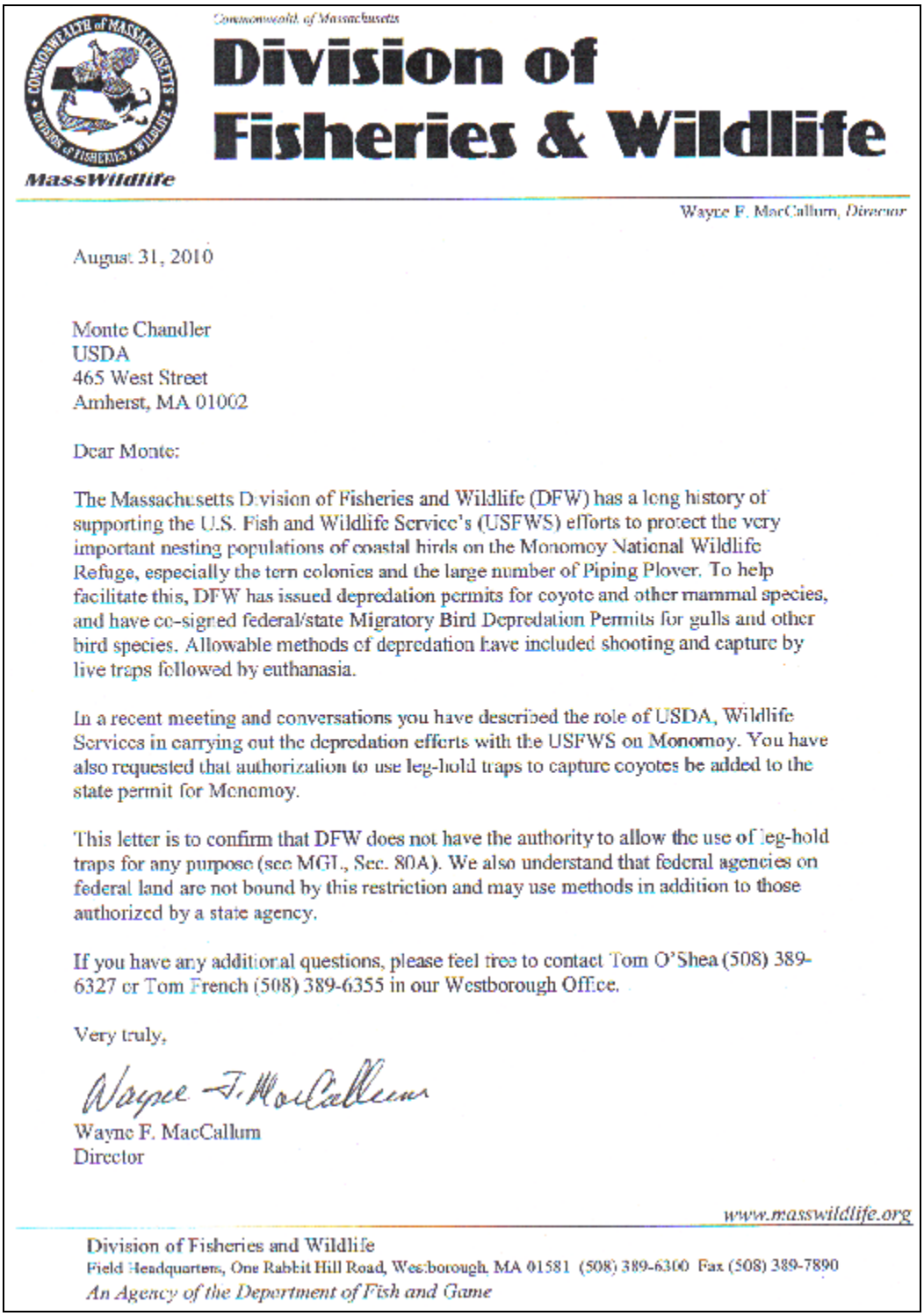
Seabeach Needlegrass	*Aristida tuberculosa*	T		
Reed Bentgrass	*Calamagrostis pickeringii*	E		
New England Northern Reedgrass	*Calamagrostis stricta* ssp. *inexpansa*	E		
Tufted Hairgrass	*Deschampsia cespitosa* ssp. *glauca*	E		
Commons's Panic-grass	*Dichanthelium ovale* ssp. *pseudopubescens*	SC		
Mattamuskeet Panic-grass	*Dichanthelium dichotomum ssp. mattamuskeetense*	E		
Rough Panic-grass	*Dichanthelium scabriusculum*	T		
Wright's Panic-grass	*Dichanthelium wrightianum*	SC		
Hairy Wild Rye	*Elymus villosus*	E		
Frank's Lovegrass	*Eragrostis frankii*	SC		
Saltpond Grass	*Leptochloa fusca* ssp. *fascicularis*	T		
Sea Lyme-grass	*Leymus mollis*	E		
Woodland Millet	*Milium effusum*	T		
Gattinger's Panic-grass	*Panicum philadelphicum* ssp. *gattingeri*	SC		
Long-Leaved Panic-grass	*Panicum rigidulum* ssp. *pubescens*	T		
Philadelphia Panic-grass	*Panicum philadelphicum ssp. philadelphicum*	SC		
Drooping Speargrass	*Poa saltuensis* ssp. *languida*	E		
Bristly Foxtail	*Setaria parviflora*	SC		
Salt Reedgrass	*Spartina cynosuroides*	T		
Shining Wedgegrass	*Sphenopholis nitida*	T		
Swamp Oats	*Sphenopholis pensylvanica*	T		
Small Dropseed	*Sporobolus neglectus*	E		
Northern Gama-grass	*Tripsacum dactyloides*	E		
Spiked False-oats	*Trisetum spicatum*	E		
Podostemaceae (Threadfeet)				
Threadfoot	*Podostemum ceratophyllum*	SC		
Polygonaceae (Docks, Knotweeds)				
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Strigose Knotweed	*Persicaria setacea*	T		
Sea-beach Knotweed	*Polygonum glaucum*	SC		
Pondshore Knotweed	*Polygonum puritanorum*	SC		
Seabeach Dock	*Rumex pallidus*	T		
Swamp Dock	*Rumex verticillatus*	T		
Portulacaceae (Spring Beauties)				
Narrow-leaved Spring Beauty	*Claytonia virginica*	E		
Potamogetonaceae (Pondweeds)				
Algae-like Pondweed	*Potamogeton confervoides*	T		
Frie's Pondweed	*Potamogeton friesii*	E		
Hill's Pondweed	*Potamogeton hillii*	SC		
Ogden's Pondweed	*Potamogeton ogdenii*	E		
Straight-leaved Pondweed	*Potamogeton strictifolius*	E		
Vasey's Pondweed	*Potamogeton vaseyi*	E		

Pyrolaceae (Shinleaf)				
Pink Pyrola	*Pyrola asarifolia* ssp. *asarifolia*	E		
Ranunculaceae (Buttercups)				
Black Cohosh	*Actaea racemosa*	E		
Purple Clematis	*Clematis occidentalis*	SC		
Golden Seal	*Hydrastis canadensis*	E		
Tiny-flowered Buttercup	*Ranunculus micranthus*	E		
Bristly Buttercup	*Ranunculus pensylvanicus*	SC		
Rosaceae (Roses, Shadbushes)				
Small-flowered Agrimony	*Agrimonia parviflora*	E		
Hairy Agrimony	*Agrimonia pubescens*	T		
Bartram's Shadbush	*Amelanchier bartramiana*	T		
Nantucket Shadbush	*Amelanchier nantucketensis*	SC		
Roundleaf Shadbush	*Amelanchier sanguinea*	SC		
Bicknell's Hawthorn	*Crataegus bicknellii*	E		
Sandbar Cherry	*Prunus pumila* var. *depressa*	T		
Northern Prickly Rose	*Rosa acicularis* ssp. *sayi*	E		
Northern Mountain-ash	*Sorbus decora*	E		
Barren Strawberry	*Waldsteinia fragarioides*	SC		
Rubiaceae (Bedstraws, Bluets)				
Northern Bedstraw	*Galium boreale*	E		
Labrador Bedstraw	*Galium labradoricum*	T		
Long-leaved Bluet	*Houstonia longifolia*	E		
Salicaceae (Willows)				
Swamp Cottonwood	*Populus heterophylla*	E		
Sandbar Willow	*Salix exigua ssp. interior*	T		
Scheuchzeriaceae (Pod-grasses)				
Pod-grass	*Scheuchzeria palustris*	E		
Schizaeaceae (Climbing Ferns)				
Climbing Fern	*Lygodium palmatum*	SC		
Scrophulariaceae (Figworts)				
Sandplain Gerardia	*Agalinis acuta*	E	E	
Winged Monkey-flower	*Mimulus alatus*	E		
Common Name	**Scientific Name**	**MA Status**	**Fed Status**	**Notes**
Muskflower	*Mimulus moschatus*	E		
Swamp Lousewort	*Pedicularis lanceolata*	E		
Hairy Beardtongue	*Penstemon hirsutus*	E		
Sessile Water-speedwell	*Veronica catenata*	E		
Culver's-root	*Veronicastrum virginicum*	T		
Sparganiaceae (Bur-reeds)				
Small Bur-reed	*Sparganium natans*	E		
Verbenaceae (Vervains)				
Narrow-leaved Vervain	*Verbena simplex*	E		
Violaceae (Violets)				
Sand Violet	*Viola adunca*	SC		

Britton's Violet	*Viola brittoniana*	T		
Viscaceae (Christmas-mistletoes)				
Dwarf Mistletoe	*Arceuthobium pusillum*	SC		

1. Trimorphic freshwater population only.
2. Including triploid and other polyploid forms within the Ambystoma jeffersonianum/Ambystoma laterale complex.
3. Ditto
4. This species is listed by the U. S. Fish and Wildlife Service as P. r. bangsi (Plymouth Redbelly Turtle) in 50 CFR 17.11.
5. Undescribed species near I. inextricata
6. Undescribed species near P. pterisii
7. Undescribed species near Z. lunifera
8. Includes the two varieties of this species that occur in Massachusetts: s.p. var. pauciflora and s.p. var. caroliniana.

APPENDIX E
LETTER FROM THE DIRECTOR OF THE MASSACHUSETTS DIVISION OF FISHERIES AND WILDLIFE TO THE MASSACHUSETTS STATE DIRECTOR, USDA/APHIS/WILDLIFE SERVICES



Commonwealth of Massachusetts
Division of Fisheries & Wildlife
MassWildlife

Wayne F. MacCallum, *Director*

August 31, 2010

Monte Chandler
USDA
465 West Street
Amherst, MA 01002

Dear Monte:

The Massachusetts Division of Fisheries and Wildlife (DFW) has a long history of supporting the U.S. Fish and Wildlife Service's (USFWS) efforts to protect the very important nesting populations of coastal birds on the Monomoy National Wildlife Refuge, especially the tern colonies and the large number of Piping Plover. To help facilitate this, DFW has issued depredation permits for coyote and other mammal species, and have co-signed federal/state Migratory Bird Depredation Permits for gulls and other bird species. Allowable methods of depredation have included shooting and capture by live traps followed by euthanasia.

In a recent meeting and conversations you have described the role of USDA, Wildlife Services in carrying out the depredation efforts with the USFWS on Monomoy. You have also requested that authorization to use leg-hold traps to capture coyotes be added to the state permit for Monomoy.

This letter is to confirm that DFW does not have the authority to allow the use of leg-hold traps for any purpose (see MGL., Sec. 80A). We also understand that federal agencies on federal land are not bound by this restriction and may use methods in addition to those authorized by a state agency.

If you have any additional questions, please feel free to contact Tom O'Shea (508) 389-6327 or Tom French (508) 389-6355 in our Westborough Office.

Very truly,

Wayne F. MacCallum

Wayne F. MacCallum
Director

www.masswildlife.org

Division of Fisheries and Wildlife
Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game